THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXIV. No. 1631.] LONDON, AUGUST 14, 1894. [46TH YEAR. PRICE 6d.

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PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

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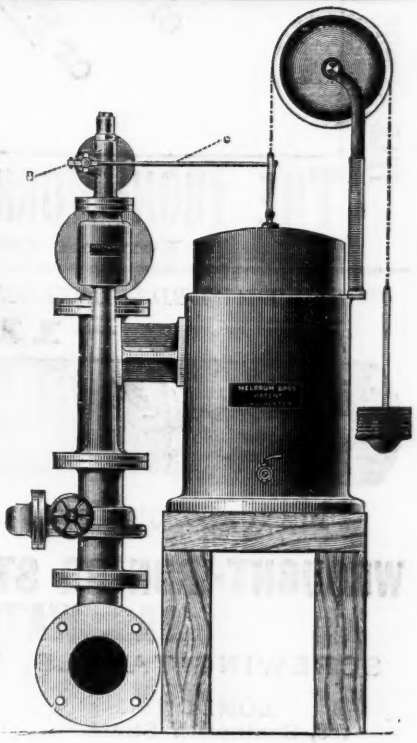

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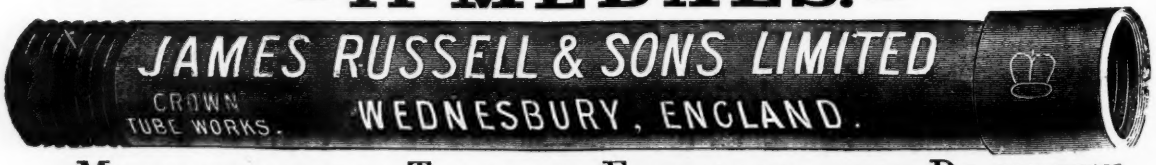

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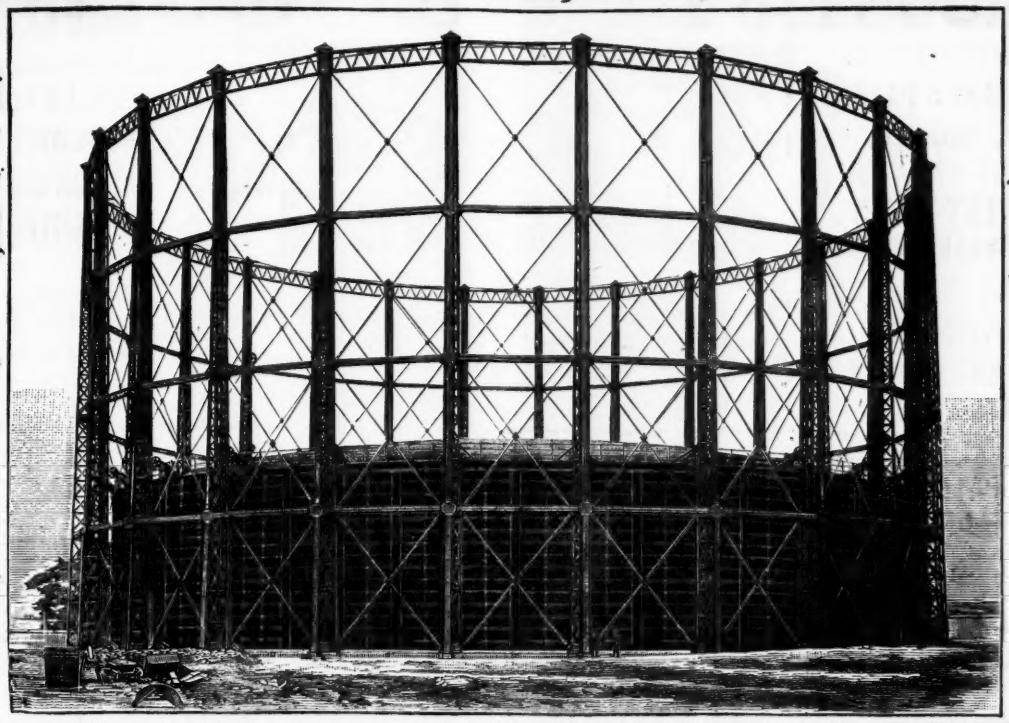

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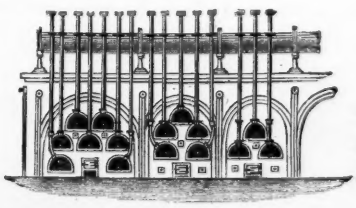

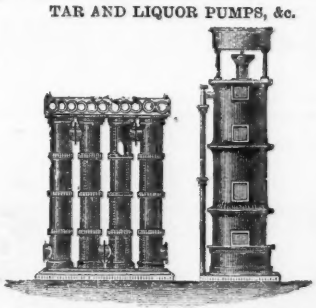

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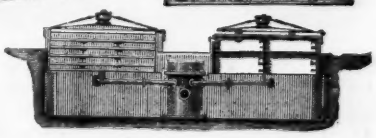

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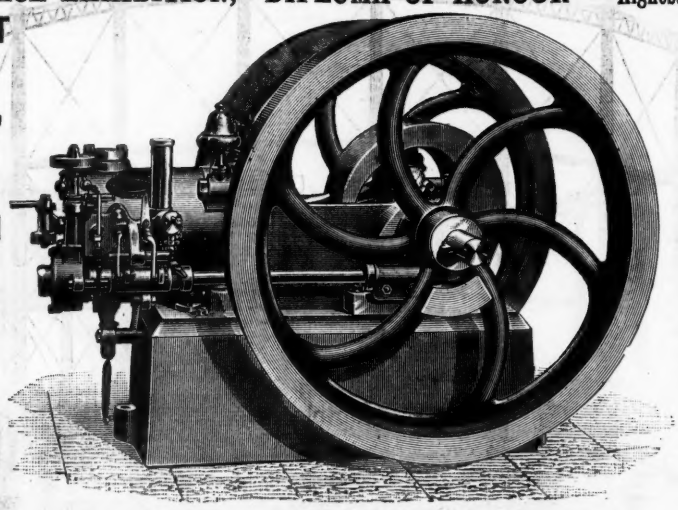

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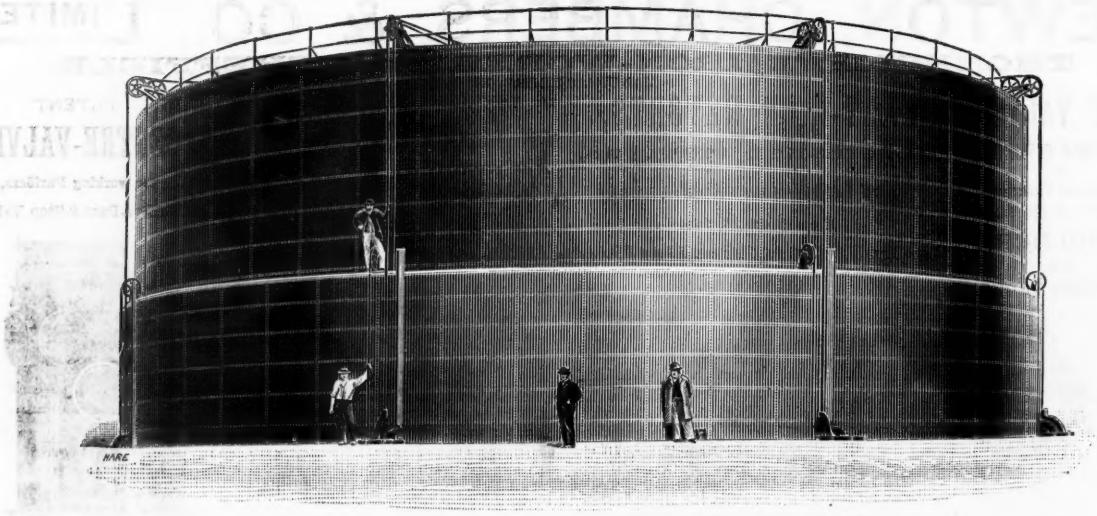

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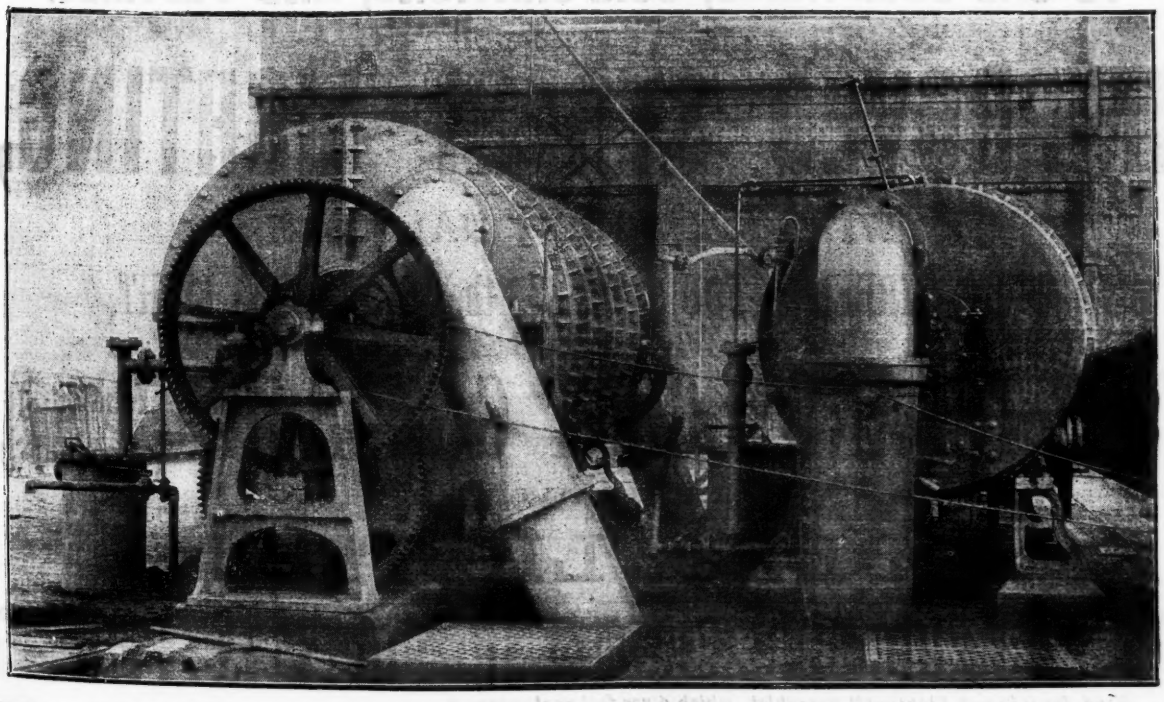

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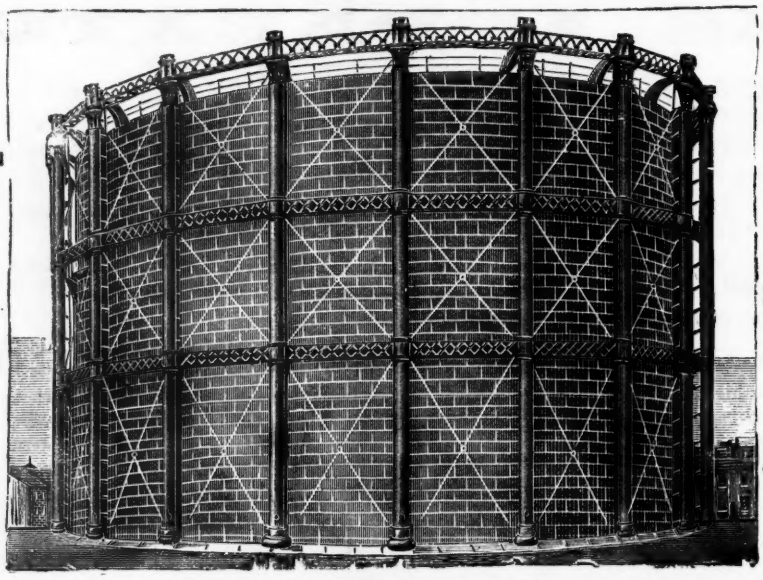

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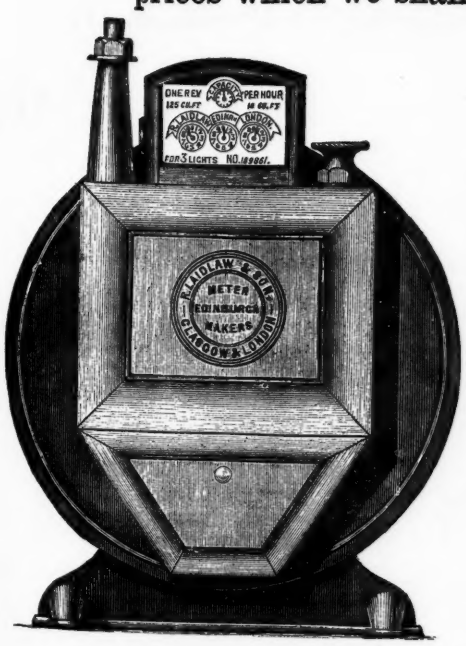
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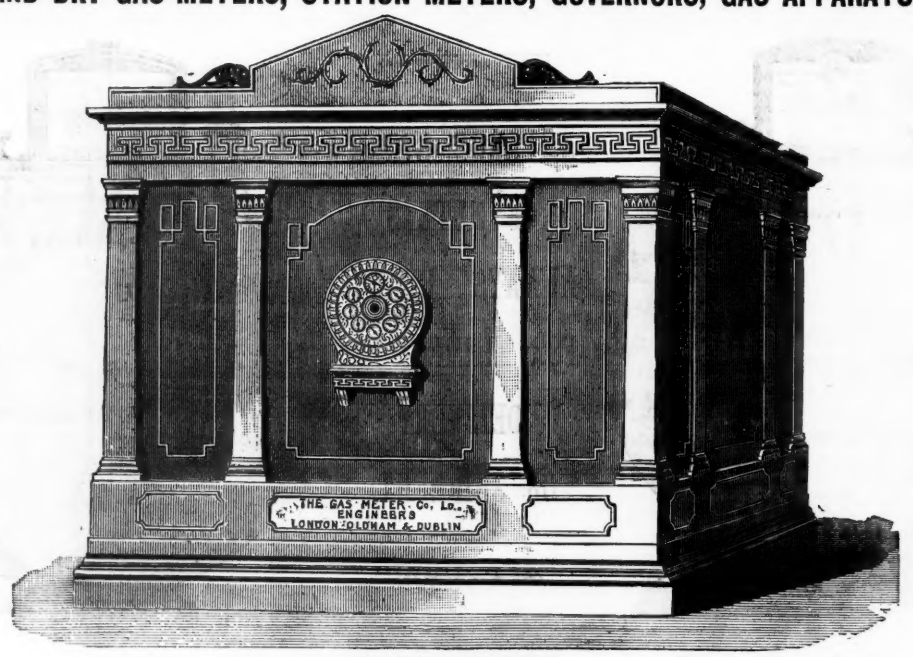

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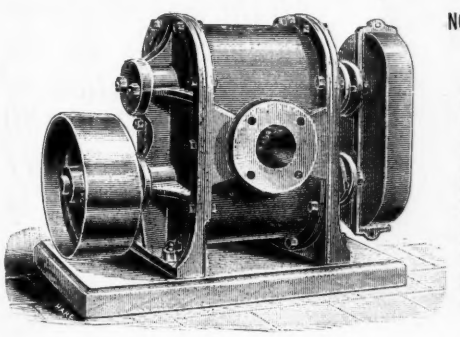
NO SLIDES OR FRICTIONAL WORKING PARTS.



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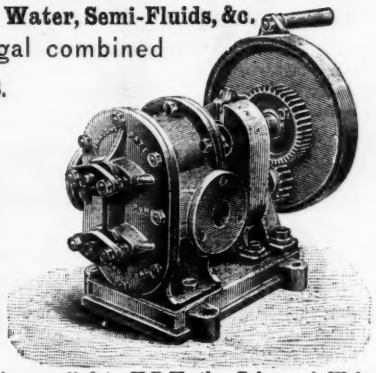

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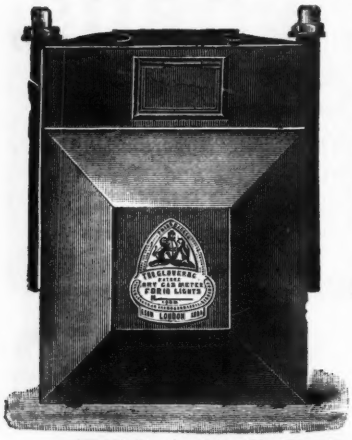

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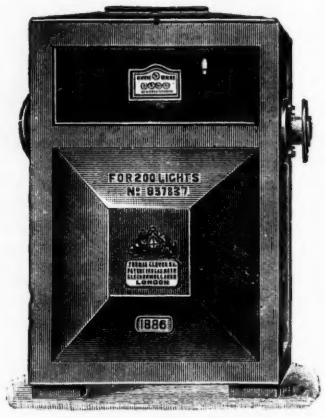

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TO CORRESPONDENTS.

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Telegraphic Address: "GASKING LONDON."

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, AUGUST 14, 1894.

The Agitation against the Chartered Company.

IN another part of the present issue of the JOURNAL will be found a special report of the interesting proceedings of Thursday last, when a deputation of the various local authorities of the northern district of The Gaslight and Coke Company and of the new Gas Consumers' Protection League—marshalled for the purpose by Mr. James Rowlands, M.P., and Sir Albert Rollit, M.P.—waited upon Mr. Bryce, the President of the Board of Trade, to express their discontent with the existing system of gas supply in the Metropolis. We have reported practically in full the speeches of the members of the deputation and the ministerial questionings and response, because the importance of the incident cannot be denied, even though it can hardly be said that it had any particular and immediate result besides drawing further public attention to the agitation which Mr. Rowlands has been carrying on for a considerable length of time. This was perhaps all that the organizers of the deputation desired, in addition to preparing the mind of the President of the Board of Trade for the further impeachment of the Metropolitan Gas Supply system which the London County Council are to lay before him. One would have to go back a long way in the history of the gas supply of London to find a parallel or a precedent for Thursday's proceedings; and even the Horseferry Road autocracy must, in their hearts, regret that things should have come to such a pass, although they may flatter the incurious shareholder that his dividend is not likely to be affected by anything that the malcontents can do to the Company without parliamentary aid. Yet it cannot be pleaded by the Directors of the Company that they have not been warned betimes of the danger to the vast interest committed to their charge, as well as to the statutory gas industry of the whole of the kingdom, which they were incurring by the maintenance, in the major portion of their district, of such a charge for gas as must inevitably bring discredit upon the system that permitted it—that is, the sliding-scale. It was the sliding-scale that put an end, as it appeared for good, to the continual agitation against the Gas Companies that went on in London and in one town after another so long as the old rule of maximum dividends existed to confirm the public in the belief that boards of gas directors had not sufficient inducement to manage their business properly and to sell gas at the lowest possible price. Under the sliding-scale and the auction clauses that came with it, a great calm has settled for many years over the gas industry; and it might have been believed as well as hoped, for the sake of all parties, that the embroilment of gas companies with their consumers and the local and central authorities was a phase of the past of the industry. The sliding-scale, being a human invention, was not an ideal arrangement; and, especially in the matter of its application, it frequently failed to give universal satisfaction. The fixing of the initial price—always a ticklish operation—was sometimes made the ground of complaint; and it is to be regretted, for several reasons, that the three London Companies which have turned out to be the survivors of the old group were not accorded uniform treatment in this regard. However, the new *régime* was brought in; and although the original holders of gas stocks profited by it to the extent of 2 per cent. or so of additional dividend, the public gained upon the influx of fresh capital, and the undertakings were generally administered in a new spirit of commercial enterprise, efficiency, and economy.

Unfortunately for London, the greater part of the northern area of the Metropolis, including the City, fell into the hands of gas administrators who have been convicted by the facts of inability to sell gas as cheaply as their neighbours. The Chartered Company obtained a standard price of 3s. 9d. per 1000 cubic feet, as did the Commercial Company; while the South Metropolitan Company had only 3s. 6d. This circumstance has been mentioned by the Governor of the first-named Company as an indication that Chartered gas was meant by the Legislature to be so much dearer than that of the South Metropolitan Company; but he forgot the case of the Commercial when he made this statement. It is hardly necessary to argue, however, that standard prices have no connection with selling prices. It is more to the present point to lay stress upon the fact that it is only the selling price that the public look at. Those who distrusted the sliding-scale when it was first introduced, used to say that there would be danger in the increased dividends that might be payable under it, and to declare that the public would never rest content to see gas stock paying 12 and 13 per cent., and even higher dividends, although such might be demonstrably due to reductions in the price of gas. Experience has shown the baselessness of this objection. Indeed, there has been complaint of certain boards of directors who, having the power to declare increased dividends if they would previously reduce the price of

their gas, refused to take this step; but no intelligent persons have blamed gas directors for making full use of the sliding-scale to the benefit of both the shareholders and the consumers.

The strength of the present agitation against The Gaslight and Coke Company resides in the disadvantageous way in which their selling price for their northern district compares with that of the other Companies, and especially with that charged by the South Metropolitan Company, to which the former are tied in respect of their southern district. They must be blind indeed who cannot see that discontent was sure to come, when year after year passed over the Metropolis, and all the amalgamations and the changes of different kinds that have marked the history of the gas supply of the capital left the Chartered consumers in no better case. It is idle to pretend that it could ever have been intended by Parliament that this state of things should have come to pass. How it is to be remedied is quite another matter. The members of the deputation to Mr. Bryce rather muddled their statements of grievance, of course; and the Minister himself, who is new to his Department, did not appear to know exactly what was wanted of him, or what it is in his power to do. It is satisfactory to note that Mr. Bryce has a firm hold of the nature of the bargain made by the present holders of gas capital; and he is not likely to countenance any movement having for its object the wronging of investors. He does appear, however, to favour the idea of transferring the gas supply of London to the Local Authority; but as against this notion, which may be nothing more than a "pious opinion," should be set the reassuring point that he desires the people of London to have the cheapest possible supply of gas. If the gas supply were ever to be administered by a local authority imbued with such sentiments as those governing the London County Council, and actually taking effect in the proceedings of this Trade-Union-ridden body with regard to the contracts for their electric lighting plant (mentioned in another column), it is not very difficult to see that the Council at least would be no improvement upon the Chartered Company in regard to the price at which they could sell gas. Mr. Bryce may be recommended to remember that, in gas supply as in other undertakings, it is impossible to eat your cake and have it. If gas undertakings are to be carried on by local authorities with the object of cheapening the supply, there will be no huge surpluses of profit to go to the reduction of rates, and there will be no spare cash for subsidizing Trade Unionists. On the other hand, if the rates are to be assisted, or the Trade Unionists coddled, up must go the price of gas.

We are not disposed to criticize the utterances of Mr. Bryce's interviewers; but we notice that Mr. Rowlands and others are inclined to make some capital out of Colonel Makins's expression when inviting Mr. George Livesey to be friendly, and join in fighting the "common "enemy." This is just the sort of phrase that agitators "playing to the gallery" would be likely to fasten upon; but we do not suppose for an instant that Colonel Makins meant to insult either the County Council or the gas consumers of Northern London by applying the term to them. Unhappily, the Chartered people seem to be cursed with a proficiency in the gentle art of making enemies, which is not the least of their disadvantages. The President of the Board of Trade is not likely to pay much attention to the verbal slips of the Chartered Governor; and we only wish, for the sake of all concerned, that the circumstances of the undertaking would so far improve as to enable the Directors to come within (say) 3d. per 1000 cubic feet of the South Metropolitan price, when the Department would not be further troubled with care for either the sayings or the doings of the Horseferry Road magnates.

The Plymouth Settlement.

Last week we gave the particulars of the settlement that has been arrived at in the House of Lords with regard to the Plymouth Company's new capital arrangements. It is unnecessary to repeat the terms of the settlement here; and all that we now desire to do is to draw attention to them by way of completing our notices of one of the most important Gas Bills of the session. The Plymouth Gas Company, like most others, had capital of various classes, which came in due course under the sliding-scale, and presented difficulties in the way of consolidation upon a simplified basis. The truth is, as Mr. George Livesey has often argued, that the intermediate classes of gas capital—7½, 7, and in some instances, we believe, 6 per cent.—which were created under the scheme of the 1847 legislation, became obsolete when the sliding-scale was introduced. Then the rise and fall of a quarter per cent. of dividend for a penny on the price of gas, which was considered fair for the original 10 per cent. capitals, was also applied indiscriminately to the 7 per cent. or new capitals; and this was disproportionate. We have wondered why the Board of Trade abetted this unequal treatment of the 10 per cent. and 7 per cent. shareholders; but the matter has remained a mystery. To give a quarter per cent. additional upon 7 per cent. for a penny, is to put this class of shareholder at an advantage as compared with the holder of original shares, for which there is no apparent justification. And when these different stocks come to be unified and reduced to a 5 per cent. consolidated stock, the computation accentuates the discrepancy. All sliding-scale stock to which the old rule of a quarter per cent. for a penny is applied should be 10 per cent. stock, like that of the London Gas Companies, for which the ratio was originally established. Applying it to any intermediate classes of capital causes confusion. The reason for the 7 per cent. limitation of dividend has ceased to exist. Its place is taken by the new 5 per cent. class of stock, which goes up and down by fractions of one-eighth per cent. for each penny on the price of gas; and it should be done away with in every case where this course can possibly be taken. It is a matter for congratulation that the Plymouth Company's business has been finished in such a quiet, rational way; and we have not the smallest doubt that in their case, as in the experience of the Crystal Palace District Gas Company, the consolidation of capital invested in the undertaking will result in a substantial economy.

Directors, Shareholders, and the Public.

It is a striking testimony to the force of individual ability and character, that, in an age when so much of the work of the world is effected through the agency of corporations, the public should turn eagerly, as they do, to the reported utterances of a select few heads of trading, transit, and industrial companies, for the sake of the luminous exposition of the actual state of affairs in regard to their own and the cognate undertakings which these recognized authorities are alone able to give. There are hundreds of chairmen of these different kinds of companies in the United Kingdom—all, of course, gentlemen of more or less "credit and renown." But the number of railway, steamship, manufacturing, or commercial companies' chairmen who can truly be said to possess the ear of the public, whether general or specialist, can, in any department, be told on the fingers of one hand. The fact is that the well-known term of the "qualification" of a director, in the majority of cases, means little more than it does in law—the possession on the gentleman's part of a certain amount of money invested in the stock of the company. So long as he is strictly *compos mentis*, and has this necessary money qualification, any man may aspire to be a director of any company. And the accident of his election to this position depends in practice upon an infinite variety of influences which need not be catalogued here. Such as the Board are, such is its official head, in the majority of instances. He must, by law, represent money-bags; but he need not represent brains, energy, business capacity, or even common civility and good manners. Being, however, ordinarily an upright, educated English gentleman, the average company chairman very rarely offends against the canons of "conduct in the chair" established by public opinion. The same remark applies to the greater number of the public-spirited gentlemen who are called, in the course of their ordinary duty as ratepayers' representatives, to preside over municipalized undertakings such as gas and water works. Unquestionably, the average administrative results achieved under this almost hap-hazard style of selecting, or electing, the heads of important supply organizations are such as to lend force to the Collectivist demand for the nationalization or the municipalization of mines, railways and tramways, and other undertakings as yet left to the control of what is theoretically private enterprise, but is practically a system from which the influence of the personality of the head has been to a high degree eliminated. The chairman of a great company is

almost as indefinite a figure as the president of a Government Department; yet here and there a commanding individuality occurs in such a position, whose capacity as a representative of the practical as well as the formal aspect of the organization to which he belongs is generally recognized and appreciated. The community could ill spare such interesting figures; and this is not the least cogent of the arguments that can be used by those who deprecate the total extinction of the joint-stock system of trading, and doubt whether in all cases the chairman could be expediently superseded by a commissioner.

Speaking not now of gas companies, lest our remarks should be supposed to have some personal object, but of railway companies, how striking is the position occupied by Mr. J. S. Forbes, as contrasted with that of many nominal heads of some of the largest undertakings of the kind in the administration of which he has established his reputation! Whether interested in his particular lines or not, everybody who has knowledge of the man, albeit but through perusing some observation of his in the papers, reads what the Chairman of the London, Chatham, and Dover Railway and of the Metropolitan District Railway has to say when he meets his constituents; for he is never commonplace, and frequently gives expression to observations of wide import. His last performances in this line are especially worthy of regard, since he took the opportunity of protesting, vigorously and to the point, against an evil which does not affect railway companies alone. This was "the enormous taxation under which "we labour from year to year, and which afflicts this "Company, notwithstanding the very great public service "it renders to the working classes, quite as severely as— "nay, much more severely than it does some of the larger "corporations." Mr. Forbes was at the time speaking to the Metropolitan District Railway Company's shareholders; but his words might be echoed by the heads of many other undertakings which have the quality of being fixtures in particular localities. These might complain, like him, that "rates and taxes keep growing and grow- "ing; and the ingenuity of the Assessment Committee "and of the paid gentleman who gets a commission for "working up the taxation of these public companies "develops that continually-increasing burden. How long "that is to go on, I don't know," said Mr. Forbes, who went on to protest against the way in which vote-hunting politicians seek to victimize the railway and other corporations just for the sake of currying favour with the majority of voters. He expressed the wish that shareholders, as such, would combine to protect their own interests; but the hope is vain. The average shareholder will do nothing of the kind. He attends the meetings of the companies in which he is most interested, and if the dividend is satisfactory to him, he applauds the Board and all their doings. But if the returns do not happen to be satisfactory, he rends the Board. Between these extremes he is simply inert.

Manchester District Institution of Gas Engineers.—We are asked by the Hon. Secretary of the above Institution (Mr. S. S. Mellor, of Northwich) to intimate that the next quarterly meeting will be held at Huddersfield on the 25th inst.

Mr. F. M. Evanson has been appointed Engineer and Manager of the hydraulic supply works of the Manchester Corporation. The works were visited by the members of the Institution of Mechanical Engineers on the occasion of their recent meeting in Manchester; and a paper descriptive of them has been promised for a future meeting by Mr. Corbet Woodall, M.Inst.C.E., by whom they were designed.

Death of Mr. John Field.—We regret to record the death, on the 6th inst., at his residence, Southsea House, Dorking, of Mr. John Field, whose name is associated with the well-known "Analysis" of the accounts of gas undertakings. Mr. Field was appointed a clerk in the service of the late Imperial Gas Company as long ago as 1826. In course of time he became the Chief Rental Clerk; and in 1859, upon the death of Mr. John Mark, the Company's Accountant, he was appointed to succeed him. He retired in 1876, upon the completion of the amalgamation of the Company with The Gaslight and Coke Company. He commenced compiling the "Analysis" in 1869; and the first publication of the tables was in 1872. The last issue of these important statistics was the twenty-fifth; and those of our readers who have had to consult these annual publications do not need reminding how vastly their value has been enhanced of late years, under the supervision of Mr. J. W. Field, the Secretary and General Manager of The Gaslight and Coke Company. The late Mr. Field was in his 87th year.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 345.)

In the week just closed, the result has been apparent of the utter breakdown in the value of money, which was marked by the reduction made by the joint-stock banks in their rate of interest allowed on deposits. The necessity for investment has pressed more hardly than ever; and the consequence was that prices in general mounted up still higher. This movement was aided in some measure by favourable incidents; a brighter view being taken of the United States tariff tangle (though whether this was altogether warranted may yet be questionable), and home railway earnings producing satisfaction. High prices led to some little profit-snapping, which brought about a momentary check; but the genuine demand for investments was irresistible. Meanwhile the Gas Market has gone on gaining in strength, without even undergoing the temporary arrest suffered by others. Business has been pretty active, especially so considering that we are in the idle season, and most issues have made more or less substantial advances in quotation. In regard to Gaslights, the "A" was steadily dealt in at improving figures—starting at 249, and closing with a bargain at 254 (the best of the week); while the quotation showed a corresponding advance. A fair amount was done in the 10 per cent. preferences; but no transactions were marked in any other of the secured issues. There was some degree of activity in South Metropolitans in the earlier part of the week; but it tailed away to nothing. A satisfactory report and accounts helped to accentuate the general strength; and all three issues rose in price. A couple of bargains in Commercial old were marked at high figures; and the quotation rose two points. Little was done in Suburbans and Provincials; but several prices were advanced—*e.g.*, Brentford old and new and Crystal Palace. The Continental Companies were firm generally. Imperial improved 1; and Malta, ¼. There was no movement in any of the rest, except a slight advance in Buenos Ayres debentures; while the shares fractionally receded. Business in Water was very quiet; the chief feature being an advance in Kent upon the declaration of a 12 per cent. rate of dividend.

The daily operations were: Business in Gas was moderately active on the opening day (Tuesday); and Gaslight "A" rose 2. Wednesday was very brisk; and there was considerable movement in quotations. Brentford old and new, Commercial old, Crystal Palace, Gaslight "J," and South Metropolitan "B" and "C" rose 2 each; Gaslight "A" and South Metropolitan "A," 1 each; and Malta, ¼. New River gained 3. Thursday was quieter, and Gas quotations did not move, except for a fall of ¼ in Buenos Ayres; but Kent Water advanced 4. Friday also was a less active day; but prices ruled higher. Gaslight "A" improved 2; and Imperial Continental, 1. Saturday was quiet as usual; and quotations closed unchanged.

ELECTRIC LIGHTING MEMORANDA.

The Possibilities of Electrical Road Traction—The Limitations of the Storeage Battery—The Illuminating Power of Arc Lamps—The London County Council's Electric Lighting Contracts.

Electricians are laudably anxious to develop the application of electricity to the purposes of traction, in which direction lies the potentiality of very much more business and profit than can be expected from the lighting branch. At the same time, it cannot be denied that the net results gained so far under the head of electrical traction, whether regard be had to the rapid transport of passengers, or to the rougher purposes of goods traffic, are not commensurate with the efforts that have been put forward to this end by electrical engineers and their financial backers. A good deal was expected at one period from the system called "telpherage;" but nothing has for a long time been heard of this ingenious plan. The electric launch business, after having fairly established itself upon the Upper Thames and other waterways having a large pleasure traffic, makes little or no headway. The limits of convenience in propelling pleasure-boats by means of storeage batteries have been ascertained; and some of the larger craft originally fitted for this method of propulsion have, we believe, already been converted into steamers. Subterranean and overhead electrical tramways have a definite field of utility open to them in relieving the most congested streets of old and populous cities; but, after all, the number of such undertakings capable of being constructed and worked at a profit is very limited. The trolley-wire system of working electrical tramways is reported to be rapidly superseding all others in the United States; which, as an English electrical contemporary observes, is gratifying to the electrical engineer, while it should not blind him to the difficulties in the way of its adoption nearer home. Recently, a fresh movement has been started in Paris, having for its object the production of an unobjectionable and practically efficient electrically driven carriage capable of running upon common roads. Prizes have been offered for the best machine of the kind; and awards have been made to a variety of ungainly-looking "traps"—the

homely term seems specially appropriate in this connection—which, to the unprejudiced observer of the illustrations of them that have appeared in some of the technical journals, have not the smallest chance of inspiring a desire to ride in them in anybody but their makers. The truth of this matter is, as the *Electrical Review* aptly points out, that the common sense of the community insists upon mechanically-driven vehicles being confined to rails. The common steam traction-engine is the generally abominated exception that proves this rule. Moreover, no practically successful electrical or steam road-carriage has been made. The weight of the necessary gear is prohibitive; but if this initial difficulty could be surmounted, a free-running mechanical road-carriage would be a nuisance.

As illustrating one of the points mentioned in the foregoing paragraph, we note a curious computation, for which the New York *Electrical World* is responsible, of what it would mean to drive the new Cunarder *Campania* by electricity instead of steam. The calculation was suggested by the occasional newspaper predictions that cause the ignorant to gape and the better-instructed to smile, as to the possibilities of the coming storeage battery, which, when perfected, is to be used for the propulsion of ocean steamers. While not anxious to assign a limit to the possibilities of improvement in this class of electrical apparatus, our contemporary shows that a good deal of ground will have to be covered before electricity supersedes steam in ship propulsion. The vessel chosen for illustrating the point has a displacement of 18,000 tons, and has crossed the Atlantic at an average speed of 21 knots, corresponding to about 26,000 average horse power and a coal consumption for the trip of about 2700 tons. Assuming storeage batteries of 50 lbs. to the hourly horse power, the entire weight of batteries necessary to do the same work, and allowing no reserve at all, would be 76,750 tons; or more than four times the entire displacement of the ship. To determine the weight per horse power that a storeage battery should have to compete with the steam machinery in the case under consideration, it is assumed that the entire weight of the boilers and machinery of the *Campania* is 3750 tons, to which the weight of the coal consumed on a trip—2700 tons—should be added; making a total weight of 6450 tons permissible for the electrical plant. Assuming the weight of the electrical propelling machinery to be 1500 tons, there will remain 4950 tons for the total weight of the batteries. With these data, it appears that the weight of a battery, allowing for no reserve, would have to be 3·16 lbs. per hourly horse power. How small this is can be appreciated from the fact that a 150 ampère-hour cell would weigh on this basis only about 1¼ lbs.—really about the weight of its lugs. A similar calculation shows the impossibility of storeage batteries displacing steam locomotives.

As a contribution to the settlement of the much-debated question of the true illuminating power of electric arc lamps, it may be remarked that the duty of the ordinary 450-watt arc lamp—the old Brush 2000-candle power impostor—was stated at the Philadelphia meeting of the American Institute of Electrical Engineers, by Professor Anthony and several other speakers who have made hundreds of photometrical tests of such lights, to not ordinarily give a mean spherical illuminating power of 500 candles when enclosed in a clear glass globe. As against this statement, it is only fair to admit that certain experiments made in Germany with the object of ascertaining whether the alternating or the direct current is to be preferred for arc lamps of this description, gave illuminating powers ranging from 823 candles with the alternating, to 1292 candles with the direct current and the same energy. It seems only possible to reconcile these values by assuming that there must be very considerable difference in the light-giving powers of the respective carbons. It has long been known that the amount of light developed by arc lamps materially depends upon the quality of the carbons used; but it has not been established by comparative experiments to what extent the difference may range. Yet it is reported, upon the authority of an arc lighting station superintendent of great experience, that it is not unusual to come across carbons that will make a difference of 50 per cent. in the amount of light evolved from the arc. If this is the case, it is time that the matter was looked into.

The London County Council are going on with their scheme for lighting the Victoria Embankment with electricity, and have issued a specification of the plant required, which has carried dismay into the engineering and electrical world. Our contemporary *Engineering* devotes a leading article to this egregious production, which is of importance as showing what it means when a Local Authority sets itself to act the part of an earthly Providence to protect the workman from oppression by his employer. The contract is a comparatively small one; comprising the provision of three engines of 70 indicated horse power, coupled direct to dynamos of corresponding size; two engines of 25-horse power, with dynamos for exciting the main generators and lighting the station; three switchboards; and general accessories. Yet it takes 42 clauses, covering 17 printed pages, to define in a general way the position of the contractor to his employees and to the Council. The hours of labour, the rates of wages and overtime, the conditions of engagement are all to be in accordance with Trade Union requirements. The wages sheets are to be exhibited to the Council on demand, subject to fines of £3 and £10 for non-compliance; and in case the Council discover that any man has been paid less than they think he deserved, they will pay him the balance, and deduct the amount from whatever money may be due from them to the contractor. Finally the Engineer to the Council is to be sole arbitrator in any dispute. The effect of this arbitrariness on the part of the Council will be either that the best contractors will decline to have anything to do with their work, or else that an ample margin of charge will be clapped on to the price to cover the higher cost of working under the tyranny of the combination of the Trades Unions and the Council.

THE PROBLEM OF CASUAL LABOUR.

WHILE the Royal Commission on Labour has been engaged in investigating the conditions under which the British workman, in his multifarious classifications, is accustomed to earn his daily bread, it has on its own account exhibited to the world one of the most remarkable examples of organized industry and zealous devotion to duty that has ever been displayed by a governmental department. Whatever else the Commission has done, or has left undone, it has at any rate established a standard of energetic and intelligent devotion to the performance of the task set before it that future Royal Commissions can hardly be expected to improve upon. Much of the credit for this must be given to the President (the Duke of Devonshire) and the other Commissioners, who have interpreted their charge as being other than that of aiding to shelve a variety of difficult and complex questions in industrial economics while making the best of the opportunity for advertising themselves and their own notions. But no small portion of it is due to Mr. Geoffrey Drage, the Secretary of the Commission, who by character and training was one of the best men in all England for the post that, by a happy inspiration, was conferred upon him at the outset of the inquiry. The industrial community has been greatly interested in, and more than a little surprised at, the bulk and number of the Blue Books edited, and in a large measure compiled, by Mr. Drage in his official capacity. But that the same man should have found time and energy for the composition on his own account of a book of close on 300 pages, dealing further with a particular development of the labour question, borders on the amazing. It is the fact, however; and we feel it due to Mr. Drage, having followed his official work with a particular degree of attention and appreciation, to acquaint readers of the JOURNAL with the nature and scope of his personal endeavours to throw light upon the question of the unemployed.*

It must be sufficiently obvious that almost the first thing to strike an inquirer into the question of labour will be the state and character of that order of so-called workers who, as a matter of fact, do not work, or at best work occasionally and intermittently. There is no section of the community of greater political importance than this. From a scientific point of view, this margin of potential producers, but of actual non-producers, represents the waste inseparable from the tentative adjustment of means to ends which is so essential a feature of our industrial system, based as it is upon free competition between material and material, and between man and man. In a sense, every man upon his attaining the working age is an available unit for recruiting the world's working force. Until he finds his place in the ranks of industry, and whenever he falls out of those ranks, he is an example of the unemployed. Regarded in this light, the unemployed are to be found in every class of the community; and perhaps most of us who are working men at this moment have been numbered among the order at one time or another, and may become so again. It is not in this sense, however, that politicians think of the unemployed. In the vernacular of the day, and particularly when the word is spelt with a capital letter, this is a term signifying the fringe, and also the residuum, of the lowest descriptions of wage-earners—the casual pickers-up of odd jobs, the loafers, street-corner men, river-side amphibians, and such like, many of whom could not perform any kind of regular work even if they had the offer of it, and yet at the best are not altogether useless in their own way, while at the worst they constitute a standing danger to the whole community. These are the unemployed who in slack times amuse themselves by "demonstrating" in parks and public places. But there is yet another section of unemployed, who are occasionally classified with the capital letter—the margin of handicraftsmen and able-bodied labourers who constitute the reserve of the industrial army; men who are thrown out of employment by the vicissitudes of trade, and only lack opportunity for becoming regular workers. It is the lot of these men that has most severely exercised the souls of the worthy people who would fain have industrial occupations ruled chiefly by humanitarian considerations.

Mr. Drage begins his book with a preface, which promises that the whole question of the unemployed shall be dealt with comprehensively. It is a daring programme, and one that no single individual could hope to grapple with conclusively. Mr. Drage had, in starting his own attempt, the advantage of following the recent governmental essays upon the same subject; and he does not hesitate to express himself strongly with regard

* "The Unemployed." By Geoffrey Drage, Secretary to the Labour Commission. London: Macmillan and Co.; 1894.

to the manner in which the Board of Trade Blue-Book on the Unemployed was put together. He falls foul also of the *Labour Gazette*; and he roundly accuses the Board of Trade of grossly mismanaging what might conceivably have been made a useful publication. He is very outspoken in asking who is responsible for this production, and what the heads of the Department do for their handsome salaries. He says himself, moreover, that, although he is not afraid to put his name to some destructive criticism of the administration of the Labour Department of the Board of Trade, he has not been satisfied with this kind of criticism, but has ventured to tell the Department how to do their work. This should be interesting, if not particularly comforting, reading to the officials concerned. But the present book would not have recommended itself to the non-official work-a-day world if the author had stopped there. For the benefit "of the practical man, who is inclined to leave the theoretical and statistical side of the inquiry to professors and bureaucrats," he has gone further, and given his own account "of the nature and causes of the present distress," winding up with "some indication of the lines on which the problem can be practically solved."

The book is accordingly divided into four parts. The first part is introductory; being made up of a critical account and classification of agencies dealing with the unemployed. This is very short. The second part states what has been done hitherto to solve the problem of the unemployed. In the first place, Mr. Drage treats here of those agencies which confine themselves to seeking for vacancies. He puts the Trade Unions which undertake this kind of duty to their members, among the most effective within the area they embrace. By no means all unions perform this task; but it is admitted that, where they do, they possess in the highest degree some qualifications enabling them to do it satisfactorily. Most unions that pay unemployed benefit recognize the principle that "the amount should not be fixed at a price so high as to act as a temptation to members to prefer idleness or benefit to work and its obligations. Nor should the benefit be paid for an unlimited period of time, which might also cause members to relax their efforts to obtain work." It is remarkable how, when Trade Unions have their own interests to protect, they drop the doctrine of the immaculateness of the workman, which they are apt to put forward when it is a matter of conflict between workmen and their employers. Another way of dealing with lack of employment favoured by some unions is the equalization of work among all the members of a trade, by reducing the hours of labour and discountenancing overtime. The Labour Bureau system is mentioned; and its advantages and deficiencies are fairly discussed. But the author evidently is not greatly impressed by the system as it must be carried on in England, even when special care is exercised in order to separate the functions of a labour exchange from those of a relief agency. Widely distinct from the agencies that seek work are those whose object is to make work. This aspect Mr. Drage considers in two chapters; one being devoted to the discussion of permanent, and the other of temporary arrangements for this purpose. It is a peculiar distinction of this book that it tells the results of a variety of interesting industrial experiments of which only the beginnings—frequently heralded with a flourish of journalistic trumpets—are generally known to the public. Mr. Drage is a terror to agitators for relief works, and to all the numerous class of gushing philanthropists who have no other idea as regards the relief of the unemployed than the vague suggestion that somebody—the local authorities or the Government—should "do something" to provide the poor fellows with work; for he knows too much of how this sort of thing ends in practice. If for no other reason, his book should therefore be in the hands of all public men whose position exposes them at any time to the attacks of the numerous varieties of would-be benefactors of the poor at other people's expense.

It is in the third and fourth parts of his book that Mr. Drage has "let himself go," so to speak, with the object of attacking his subject with the slightest possible restraint from the observations and conclusions of other inquirers. In his third part, the author investigates the causes of the discrepancy between the amount of work to be done at any time and the number of hands available for doing it; and he has no difficulty in formulating the general conclusion that "apart from seasonal and purely temporary causes, the state of trade is subject to wide fluctuations, extending over a period of several years, and affecting the whole industrial system." If this is not merely another way of saying that prices must govern wages, it would be hard to give the general statement any other equally pertinent special application. Mr. Drage proceeds to classify the unemployed, of whom he distinguishes two main classes—those with whom want of regular employment is merely temporary, and those with whom it is permanent. While it is possible thus to classify those who are generally known as the unemployed, it appears impossible to obtain any accurate measure of their numbers at any particular time. With regard to the class of workmen with whom want of employment is chronic, Mr. Drage remarks that the action of Trade Unions in forcing up wages, tends to intensify the grievance of the lower grades of workpeople; "for employers, working for their own interests and not from philanthropic motives, and finding themselves forced to pay increased rates, are compelled to engage only the most efficient workmen. The inferior are thus thrown out of work, to become part of a body of more or less permanently superfluous labour." As to other influences that contribute to the creation and the maintenance of the chronically unemployed class, Mr. Drage copiously quotes from the work of Mr. Charles Booth.

In his concluding part, Mr. Drage discusses what can be done in the future to solve the problem of the unemployed, which necessitates a review and classification of agencies, and an examination of socialistic and other ideals. The author has given many proofs of his ability to deal with this last order of economical topics; and in the present work he fully maintains his reputation in this respect. Finally, he will carry most of his readers with him in the belief that a solution of the problem is to be found not "so much in any one vast remedy as in a series of smaller remedies, each attacking one or more of the causes which have sufficed either to bring about or to intensify the present problem." These remedies need, in Mr. Drage's opinion, to be both wide of range and precise of application. He is not one of those who regard the course of trade as something which has an unknown origin and has automatic movements; but he insists upon the bearing of moral considerations on the general result. It would not be fair to Mr. Drage to reproduce here his main conclusions upon the questions that have struck him as arising from the considerations of the unemployed. His book is worth buying as a serviceable addition to the library of a public man. We consider ourselves at liberty to state, however, that he regards the problem, firstly, as national and not local; and that the want of employment which so often and so puzzlingly presents itself for treatment by local authorities, cannot be treated separately in the Metropolis or in any other large town. Secondly, that the question, complicated as it is even within the limits of a particular locality, would be practically unmanageable for the country as a whole by any group of experts, however competent. Thirdly, we are presented with the seeming paradox that it is nevertheless necessary that the problem as a whole should be *grasped*, though not *dealt* with, by one body. No existing agency has shown itself capable of doing this; and thus Mr. Drage is forced to the conclusion that a special group of "experts" is needed—representative of all the different interests involved, and with special knowledge of the different aspects of the problem. That is, a sort of Labour Commission in perpetuity is Mr. Drage's suggested remedy for the "unemployed" trouble; but what guarantee is there that such a body would be more efficient than the Board of Trade?

The Effect of Sulphur in Cast Iron.—In a recently issued volume of the Proceedings of the Institution of Civil Engineers, there is an abstract of a paper on the above subject by Mr. W. J. Keep. The author has for six years been trying to verify the received belief that sulphur is in every way injurious to cast iron; and he has made numerous experiments with artificially sulphurized cast iron up to 2 per cent. of sulphur, both grey and white, the results of which are recorded in the paper. The conclusion finally reached is that the proportion of sulphur retained by grey cast iron cannot materially injure the iron except by increase in shrinkage, which in the extreme ends seems to be from 0·168 inch to 0·194 inch per foot. The general testimony is that most of the sulphur present in pig iron is lost in re-melting, and that it is impossible it can be re-absorbed to any damaging extent from the fuel. The influence of sulphur is diminished by increase of carbon or silicon. In wrought iron, which is practically free from these elements, a small amount of sulphur is said to do great harm; and such iron will take up sulphur in considerable quantity. The influence of sulphur on all cast iron is to drive out carbon and silicon, to increase shrinkage, and in general to reduce strength; but in practice sulphur will not enter the iron in the foundry to a sufficient extent to realize these defects.

Books, &c., Received.—"Transactions of the Society of Engineers for 1893," edited by G. A. Pryce Cuxson, Secretary. (London: E. and F. N. Spon.) This volume records the proceedings of the Society under Mr. Valon's presidency; and among the papers is the one on "Gas Substitutes," read by Professor Vivian B. Lewes, F.I.C., F.C.S., on Oct. 2 last year, for which he was awarded the President's Premium (a gold medal). There is a general index to the proceedings from the year 1860 onwards.——"The Relations between Gas Companies and Gas Consumers," and "Gas-Burners, Pressure-Regulators, Governor Burners, &c." These are two pamphlets by Mr. W. Paul Gerhard, of New York—the former being a reprint of an article in *Cassier's Magazine*, the latter a reprint of one in the *Journal of the Franklin Institute*. Both pamphlets convey a good deal of information on the subjects dealt with, and it is moreover presented in a very readable form.——"Die Kraftversorgung der Deutschen Städte durch Leuchtgas," von Franz Schäfer, Dessau. (Munich and Leipsig: R. Oldenbourg.)——"The Water Supply of Towns and the Construction of Water-Works. A Practical Treatise for the Use of Engineers and Students of Engineering." By W. K. Burton, Assoc.M.Inst.C.E., Professor of Sanitary Engineering in the Imperial University, Tokio, Japan, Consulting Engineer to the Tokio Water-Works, &c. (London: Crosby Lockwood and Son.) A valuable book, having numerous plates and other illustrations, and containing an appended paper by Professor Milne, F.R.S., on "The Effects of Earthquakes on Water-Works."

NOTES.

The Secondary Products of Combustion.

A statement has been communicated by M. Iloswa to the *Bulletin de la Société Chemique de Paris* respecting certain determinations made by him of the formation of secondary products containing nitrogen by combustion in air. The author considers he has proved that, on burning in air one and the same volume of coal gas and of hydrogen, one and the same weight of nitrogen is converted into ammonia. On burning equal volumes of coal gas and of hydrogen, the nitrogen transformed into nitrous acid will also have approximately the same weight. But on burning carbon monoxide, nearly 2½ times more nitrogen is found in the state of nitrous acid than in the former case. Supposing one kilogramme of each of these gases to be burnt, the most nitrogen in the state of ammonia, and in the state of nitrous and nitric acids, is found in the product of the combustion of hydrogen; only one-fourth of the quantity being found in the case of coal gas, and about one-twentieth in the case of burning carbon monoxide. On burning wood charcoal in air, whether merely dried or heated to redness, the quantity of nitrogen contained in the nitrous and nitric acid collected is almost equal to that of the product. There is not much difference in the result of burning an equal weight of coke. The formation of ammonia during the combustion of coke or charcoal is merely a result of the decomposition of these substances. Otherwise it would be difficult to understand why the weight of the ammonia formed should vary according to the degree of heat. On burning coal gas and hydrogen, the sum of the equivalents of the acids named is from 11 to 15 times greater than the figures of the equivalents of the ammonia. M. Iloswa remarks that hydrogen peroxide is one of the constant components of the atmosphere, and almost always accomplishes the reactions commonly attributed to ozone. He gives up as impossible the determination of atmospheric ozone upon a scientific basis.

The Duty of the Incandescent Electric Lamp.

An important series of tests of incandescent electric lamps has been undertaken by M. Gasnier, with a view to studying, in connection with the hours of lighting, the variations in luminous intensity and in consumption of energy. The results are published in *L'Industrie Electrique;* and they are of great value as showing exactly what duty the incandescent lamps now in the market may be expected to render to the user, for current consumed. As a rule, the tests were not continued beyond 600 hours of lighting; and, of course, the makers' names are not given. It appears from M. Gasnier's tables that the average 110-volt 16-candle incandescent lamp fairly gives this amount of light when quite new, although instances are not unknown where they did not possess more than 14·3-candle power to start with. At the commencement, the consumption of energy was from 2·23 to 3·32 watts per candle. Before the lamps had been in use 200 hours, however, there was in most instances a falling off in illuminating power to the extent of 1½ or 2 candles, while the consumption of current slightly rose. Still, there was not much to complain of until the 400-hour test was reached, by which time the illuminating power was anything from a little over 8 to 14 candles. At 600 hours the illuminating power was down to about 10 or 12 candles, while the consumption of current was not far from 4 watts per candle. This appears to be the present condition of the commercial incandescent lamp.

Hints on Painting.

In a paper by Mr. M. P. Wood, read before the American Society of Mechanical Engineers, it is stated that graphite, mixed with pure boiled linseed oil to which a small percentage of litharge, red lead, manganese, or other metallic salt, has been added at the time of boiling to aid in its oxidation, forms a most effective paint for metallic surfaces, as well as for wood and fibre. Some recent experiments with this paint applied to the surface of boiler-tubes show it to be very effective in preventing the formation of scale. Mr. Wood commends the system of requiring all iron and steel intended for structural uses to be pickled and cleansed from mill-scale; declaring it to be an absolutely indispensable condition for all material of the kind intended to be preserved from rust by painting. It should then be painted two coats with pure raw linseed oil and red lead, after which the metal will stand the weather for fifty years without further treatment. Mr. Wood gives, for the benefit of engineers, a ready rule, deduced from his own experience, to determine the quantity of paint required to cover any structure. It is as follows: Divide the number of square feet of surface by 200; the quotient will be the number of gallons (American?) of liquid paint required for two coats. Or: Divide the area in square feet by 18, and the result is the number of pounds of pure white lead required to give three coats, where this pigment is permissible. Red-lead paint should be treated like Portland cement—applied to the work fresh, and allowed to take its initial set where it is to remain. A gallon of good red-lead paint contains 5 lbs. of oil and 18 lbs. of red lead; and it will cover for a first coat about 500 square feet, and as a second coat about 600 square feet of surface.

TECHNICAL RECORD.

THE GAS INDUSTRY IN THE UNITED STATES.

By Herr W. von Oechelhaeuser, of Dessau,
General Director of the German Continental Gas Company.

A Lecture delivered at the Meeting of the German Association of Gas and Water Engineers at Carlsruhe, June, 1894.

(Continued from p. 276.)

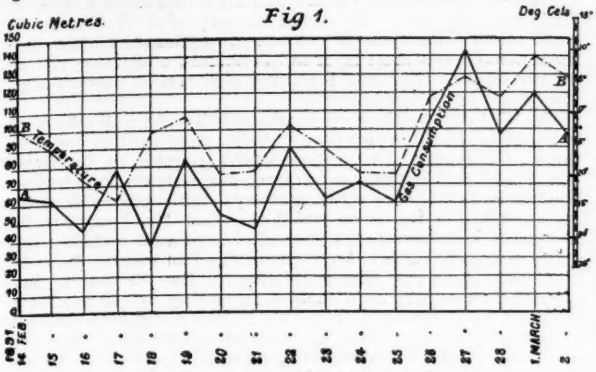
Another great natural gas company sets an instructive example as to the extent to which a scheme may be carried out for a central supply of gas for heating purposes on a sufficiently large scale to make it serviceable for the objects of the industry. The company, so far as I am aware, have reduced the price of their gas to the lowest figure, and are said to meet all the diverse requirements of trade in the most able manner. The name of the concern I am not at liberty to disclose; but, having been supplied in the most amiable manner with a great many interesting particulars, I may be allowed here to only briefly refer to some of them. The price of gas as supplied to dwelling-houses, is 25 c. per 1000 cubic feet (3·71 pf. per cubic metre), while for manufacturing purposes it is supplied at a normal rate of 12·5 c. (1·8 pf. per cubic metre). Now, it is remarkable that, even here, where prices are as low as 1·8 pf.—*i.e.*, one-eighth of the price at which lighting gas is sold in the same city—there should be room for such a laconic remark as that which occurs in a letter addressed to me on the subject: "But few can pay this rate." Separate arrangements must, in fact, be made in each case, and the figures have to be worked out specially each time; for in cases where quantities so large have to be supplied, such as those which some industrial establishments consume, it has not been possible hitherto to measure the gas by means of meters, since the cost of doing so would assume such gigantic proportions as to become almost ruinous.* It only remains, therefore, to get at a rough estimate of the probable consumption of gas, and to accept the cost of the solid fuel used before. Thus, in the case of steam-boilers, for example, a lump sum is generally agreed upon, according to the nature and the amount of the work to be performed and the particular construction of the boilers to be heated. In glass-works, the payment for gas is arranged for at a certain rate per crucible and per month; the price thus obtained amounting to about 1½ pf. In foundries and rolling-mills, the natural gas is paid for at so much per ton of iron; while in the case of puddling-works, the supply of natural gas had to be abandoned altogether, as not even by offering it at ¾ pf. per cubic metre —*i.e.*, the twentieth part of the price at which ordinary coal gas was sold in the same town—could a successful competition be kept up with the heating arrangements with which the different works were themselves provided. I am therefore of opinion that the conditions under which this and other natural gas producing companies in America supply gas, so far as I have been able to form an idea of them, corroborate the remark I made in Berlin—viz., "that it seems quite impossible that all the heat required could ever be derived from central stations," and that this observation of mine meets the case, even where natural gas is available; that is to say, a gas which, unlike non-luminous water gas, possesses a very high heating power, while its cost of production is *nil*.

A further question to be considered was this: Is it at all desirable, in the interests of the gas industry, that all the heat should be derivable from a central station; and, in particular, how far is it desirable or advantageous to extend this central heat-supply scheme to heating stoves? For cooking purposes and for motive power supply, the yearly consumption of gas is, of course, pretty uniform, as we well know; and the advantages accruing from the employment of gas for these purposes have been thoroughly appreciated for some time. By way of replying to the above question, I beg to submit to you herewith two diagrams showing the fluctuations taking place in the consumption of gas; and I take this opportunity of acknowledging that I am indebted to the kindness of the Philadelphia Natural Gas Company of Pittsburgh and of the Allegheny Heating Company (being a distributing Company, and junior branch of the former) for the diagrams, the value of which is enhanced by the fact that they are the outcome of very careful observations, and accurately record the daily and monthly consumption of heating gas by different consumers for a whole year. Fig. 1 represents the fluctuations observable in the consumption of heating gas each day. The record was taken by Mr. John Young, the Manager of the Allegheny Heating Company, himself, in his own apartments; the fluctuations of temperature occurring in the course of the day being at the same time taken into account. This graphic record enables one to ascertain at a glance what a marked influence the external temperature has in fact upon the consumption of heating gas, and how profitable this influence is to the consumer; the quantity of gas used in the stove actually rising and falling with the temperature. At the same time, it will be understood how disadvantageous this connection between

* It appears, from the latest news received from America, that Westinghouse has succeeded in devising economical meters for large consumers. But then, if this be so, the consequence will probably be to bring about a rise in the price of natural gas at places where the wasteful system of "separate arrangements" is given up in favour of exact measuring, when the whole extent of the losses hitherto sustained will be realized.

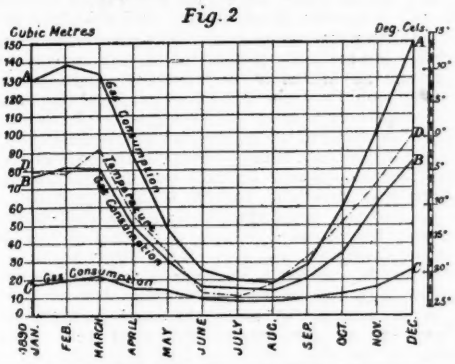
the consumption of gas and the temperature must be to the establishment which produces and supplies artificial gas. Mr. J. C. Baxter, the Managing Director of the Detroit Gas-Works, in referring to this subject, remarked to me that changes of temperature not infrequently treble the consumption of heating gas in a few hours.

Fig 1.



A Daily consumption of heating gas.
B Average daily temperature.

Fig. 2



A Average consumption of heating gas by the four largest consumers.
B do do by eighteen consumers.
C do do by the three smallest consumers.
D Average monthly temperature.

The second diagram (fig. 2) summarizes the observations made in reference to the monthly average consumption of gas, and extends over a period of one year; the corresponding temperature curve being also given. What renders these curves particularly interesting is this: They record the experience of three different groups of consumers of heating gas—viz., one group of large consumers, one group of medium consumers, and a group of consumers on a small scale. These comparative records conclusively show that the least advantage is derived from the large consumers; the fluctuations in their consumption in the course of a year being particularly marked, as in winter they consume, comparatively speaking, even a far greater quantity of gas than the customers who use lighting gas only. It will therefore be well understood that there can be no question of equalizing the production in the summer and winter by combining the central supply of light with the central supply of heating gas for stoves and furnaces. The least unfavourable condition of things is that which appears to prevail in the case of the smallest consumers, probably for the simple reason that they generally consume more gas for cooking purposes than for heating their apartments.

These observations we ought to take as a warning, so as to guard against over-shooting the mark, and rashly adding extensive heating plants to existing systems of gas-pipes, unless there is a special demand for gas, for the convenience of the public, in schools and churches, or unless the consumption is practically equal in summer and winter. I, rather unexpectedly, find this view confirmed in a report just published by the Geological Bureau for the United States, in reference to the consumption of natural gas. The *New York Commercial Journal*, in its issue for May 19 last, commenting on the report in question, said: "It appears from the report, however, that the employment of natural gas is being more and more confined to supplying the wants of families; and Indiana is the only State in which the consumption of natural gas for manufacturing purposes has at all increased in the year 1893." In addition to this, we may, perhaps, take another hint from America, in endeavouring to protect ourselves from being overpowered by an immoderate increase in the consumption of heating gas in the winter—viz., in the season in which we have, as it is, to face a maximum demand for lighting gas. The first-mentioned Natural Gas Company, which supplied me with the figures given above, endeavoured, wherever they were obliged to allow an extra discount off the price of gas—whether utilized as a heating or as a motive-power producing medium—to arrange in such a manner that the bulk of these reductions might be made in the summer. To mention one example, the natural gas used for castings and articles made in rolling-mills was sold during the winter season at a price from 25 to 30 per cent. higher than during the remaining five summer months.* Now, if a natural gas company think fit to protect themselves in this manner from undue increase of gas consumption in winter, in spite of the fact that they have no difficulties to contend with in producing the gas they supply, and that their only object is to dispose of the contents of their network of pipes at a profit, surely we are justified in taking the hint, and turning it to account if we can; all the more so as we have invariably to increase the number of our retorts and the size of our apparatus, even including the capacity of the gasholders, whenever the consumption of gas is increasing in the winter, whether for heating or lighting purposes.

It will therefore be seen that the works for the supply of natural gas herein referred to deserve our attention, not merely from a geological or purely technical point of view, but because they are so interesting and instructive, economically speaking—viz., as regards the sale and distribution of the gas—that it may be safely said that the German gas industry, by watching the development of these works, will probably avoid many a disappointment in the future, especially considering the extent to which gas is now to be developed in general use as a heating medium. If we consider that a natural gas plant can hardly be worked at a profit in the long run, even though the gas be sold at only 1 pf. per cubic metre, it is not to be wondered at that artificial gas, which is more expensive to produce, and for which the generating plant yields less profit, must of necessity be still more limited in its supply.

I said in my Berlin lecture: "All companies that have hitherto attempted to manufacture non-luminous heating gas in America, have had to abandon the idea; so that at the present time, so far as I am aware, one company only (which, however, has three establishments, one of which is situated in Hyde Park, Chicago) still continues to do so. The Chicago Exhibition, however, is sure to give us an opportunity of examining with deliberation what further steps have been taken in that direction, and of once more comparing the results of our observations with the conclusions which an economical investigation of the subject has so far enabled us to draw." Gentlemen, the comparison I was then alluding to has been made; and when I visited the works of the Mutual Fuel Gas Company, situated in the extreme south of Chicago, some distance beyond even the Exhibition grounds, I found that that Company too had abandoned the idea of finding a market for non-luminous heating gas at that last station, as they had given it up before in the towns of Jackson and St. Joseph. Luminous water gas, produced by a generator of a new and interesting design by Mr. Evans, had at the time of my visit been adopted at all stations; while previously the attempt had been made to render non-luminous heating gas serviceable for purposes of illuminating by means of the Fahnehjelm comb. But though the economical and technical conditions with which the gas industry has been confronted hitherto, have made it practically impossible to supply non-luminous heating gas at a profit, it is by no means unlikely, as we shall see presently, that the matter may be again tried at some future time, when improved incandescent gas-burners are introduced.

While I am referring to central heat-distributing gas-works, I may be allowed briefly to state that the employment of gas for domestic purposes, and more especially for cooking, has been of late assuming very vast proportions in America, and seems to be spreading rapidly; so much so that the gas-works of that country follow our example in charging for gas supplied for heating purposes a price in most cases from 25 to 30 per cent. less than that of lighting gas.† Most gas companies possess show-rooms of their own, fitted with an endless variety of apparatus specially constructed to meet American tastes and requirements; the advantages of the employment of gas being at the same time impressed upon the public mind by means of short, but well-worded, circulars and prospectuses. To the specialist, it was a positive pleasure to peruse those interesting and instructive little pamphlets, such, for example, as those issued by Mr. C. J. R. Humphreys, of Lawrence (Mass.), Mr. A. C. Humphreys, of Philadelphia, or by Mr. Judson, of the Economic Fuel Gas Company of Chicago. Some of these

* In reference to the German Continental Gas Company, I have had occasion, before this, to watch with interest an experiment that was made in the town of Quedlinburg, in the shape of a tentative tariff in which the prices of gas varied from one month to the other, no matter whether it was to be used for lighting or heating purposes. The example from America which I have cited was, therefore, a fresh inducement for us again to examine the question of the advisability of charging a higher figure in the winter than in the summer for gas supplied to the trade. It so happened that we were at the time negotiating the preliminaries of a new contract in reference to one of the towns, the illumination of which we had undertaken; and we took advantage of the opportunity for introducing into the contract, instead of the usual clause allowing a reduction according to the quantity of gas consumed, a graduated scale, setting down the price of the gas used for either heating or power-producing purposes at 14 pf. for the six winter months, and 11 pf. for the six summer months; the lighting gas being charged for at a constant rate of 18 pf. both in the summer and winter, though for large quantities an extra reduction was made, bringing the cost of this gas down to 14 pf.

† As far as I know, it was a gas company (the German Continental Gas Company) not a municipality, who first of all, in 1858, introduced lower prices for heating and cooking gas.

publications address themselves to the public at large; while others appeal more especially to gas-fitters, mechanics, or housewives. But they all suggest over and over again that the reader should see in operation the apparatus described. Want of time precludes me from dwelling further on this point, and especially from going further into the construction of the American gas apparatus on view at the Chicago Exhibition.

(To be continued.)

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

The Annual Meeting in Glasgow.

We conclude to-day our report of the proceedings at the above meeting by giving the discussions on the papers read by Messrs. Young and Galloway (see *ante*, pp. 236, 238).

DISCUSSION ON MR. WILLIAM YOUNG'S PAPER ON "FURTHER DEVELOPMENTS OF THE PEEBLES PROCESS OF ENRICHING COAL GAS FROM OILS."

Mr. YOUNG, after concluding the reading of his paper, said: The difficulties experienced as to retorts could have been surmounted in two ways. I was pleased to see the efforts that were being made by those who have introduced the process—particularly by our friend, Mr. Whimster, of Perth. He has done a large amount of experimental work. I was satisfied that this part of the research would be fully carried out independent of myself; and that is the explanation why I have turned my attention solely to devising some other means of overcoming the difficulty—by internal combustion instead of by external heating. I think it necessary to acknowledge the great assistance I am receiving in trying to overcome difficulties.

The PRESIDENT said they had the Past-President of The Gas Institute with them, and he might give them a few words.

Mr. J. WEST (Manchester) said he had had no experience at all in connection with this matter. It was, of course, a subject that all gas engineers were more or less inquiring into; and he had been watching the process a little in England. At this time last year, his friend Mr. Glover, of St. Helens, was seeking for information, and he had since adopted the Peebles process at St. Helens; and he (Mr. West) might say that Mr. Glover was very pleased that he had done so. Every time he came in contact with Mr. Glover, he spoke very favourably about the process. It enabled him to use common coal; and with common coal, he told him, he was producing as large a volume of gas as he wished, with such coals as he could not possibly use if it were not for the process. In this case he bought very cheap coal—a coal which he found near at hand—which made the process very advantageous to adopt. Of course, he had met with some of the difficulties that others had been meeting with; but they had been overcome at St. Helens. He himself anticipated, from past experience, that there would be difficulties in connection with the starting of the process; that they would not be so fully alive to the handling of the process as they would be after a little experience. This was one advantage they had by attending such meetings as the present one, and gathering from each other the practical experiences they had in working. The difficulties that he heard about some time ago had been overcome; and the explanation had been given that morning as to how they had been overcome. It struck him, when he heard of the difficulties, that probably a plate placed in the bottom of the retort would prevent cracking. He might say that he was not quite, perhaps, a believer in their 30-candle gas in Scotland. No doubt they would say that was all very well with gentlemen in the south; because they did not have the material to deal with. But to that he said that he did not think in Scotland they used their material properly, or did not get the illuminating effect out of it, as was the case in London. The chief difficulty, it seemed to him, was that they did not use gas in sufficient volume to get the carbon heated up to a state of incandescence, so as to get the luminosity out of it. If they increased the quantity used, they would light the streets (say) of Glasgow much better than they did; but then it would cost more. When he was at Manchester, he sometimes supplied 20-candle gas, and sometimes a little more. But in connection with a very large number of experiments which he made, he came to the conclusion that about 18-candle gas was the best illuminating power for the district; and although much had been said, both before and since, he still held that gas of 18-candle power was the best for that particular district. And he was not certain that it would not be the best, taking all things into consideration, for Scotch districts also. They had to take into consideration that they only required a small light, while they were obliged to use gas in such a way in Scotland that they could not get the full illuminating power out of it. He certainly would like to see a more "universal gas" used throughout the whole of the United Kingdom. They said that the quality supplied depended entirely upon the material they had to hand. He believed there was a very great deal to be said both for and against the illuminating power given in the various districts; and he was not quite at one with the President in some of the remarks he had made that morning. He did not think that consumers could properly burn what they called 30-candle gas. But, to speak of the Peebles process, he had been strongly impressed with the idea of experiments he made many years ago with reference to the stratification of gas; and he was not quite certain as to this mixing process—whether it would not be found, in practice, that there was a certain amount of layering, and that the illuminating power might vary from time to time. Perhaps, as they were distilling, they might be passing over a larger volume of poorer gas at one time than at another. Then when this passed into the holder, did it remain as a layer, or did it mix properly? He would be very glad if Mr. Young could satisfy him upon this point. It appeared to him that these heavy gases must layer in the holder; and if they did, he did not see how they could get the illuminating power during the whole time of the supply.

Mr. W. FOULIS (Glasgow) considered they were all very much indebted to Mr. Young for the admirable paper he had just given them. Of course, the process would require to be tested practically, and perhaps on a much larger scale than had yet been done, before they could say very much about its efficiency. He thought, as far as he could see, that Mr. Young, in the apparatus just described, had made his process certainly very much more adaptable to large gas-works than was the case with his former process. The regulating of the oil running into a number of retorts, on a scale such as they would require in Glasgow, had seemed to him (Mr. Foulis) a difficulty that was almost prohibitive of the adoption of the process. But this new plant looked like overcoming many of the difficulties he had foreseen. Mr. Young seemed to him to have done a great deal that, had he read his paper before he carried out his experiments, they would really have said was rather impracticable. But he had overcome these things; and therefore they must believe that the process was a practical success, so far as it had been tried. He certainly would take a very early opportunity of seeing the apparatus at work; and it might be that very shortly they would put the thing to a practical test in Glasgow. He was not quite sure that Mr. Young was right in saying that the apparatus would be an efficient water-gas making apparatus. He (Mr. Foulis) did not think—unless in the case of splint coal tar—from the experience he had had in making water gas, that there was sufficient carbon for this purpose. In an ordinary water-gas apparatus, they found that they wanted from 30 to 40 lbs. of coke per 1000 cubic feet of 30-candle gas, such as they were making now, using about 6 gallons of oil. Here they would only get 24 lbs., which would certainly not be nearly enough to manufacture water gas. But the question, of course, as to whether it would be more profitable to make water gas or oil gas, surely depended very much upon the value of the rich gas they had been making. By this process, and by having a very rich gas like that referred to, he thought it would be found that poorer coal might be used, and that consequently the necessity for making water gas as a rich gas did not exist to the same extent. Mr. West asked a question about the stratification of these heavy gases. There was no doubt at all there would be stratification if the gas was admitted first of one quality and then of another; and, although these gases would diffuse in time, diffusion, in the case of a large gasholder, would be slow. He therefore thought it would always be better, when enriching with a rich gas, that the gas should mix as early as possible in the process of manufacture—if possible in the condenser or the purifier. He was glad that he was able to agree with Mr. West—though, perhaps, differing from a great many—in stating that he did not believe in 30-candle gas. In Glasgow, they made from 20 to 22 candle gas; and he thought they gave quite as much satisfaction as where the gas was of higher quality. There was no doubt at all that people from the south, looking at the street-lamps in Glasgow or Edinburgh, were very apt to say, "Well, we are quite as good as you are, although we are only giving 16-candle gas." But when it was known that the street-lamps in Glasgow (and he dared say they were not much better in Edinburgh) consumed merely 2 cubic feet of gas per hour, whereas, in the South, 4 or 5 cubic feet was almost the minimum quantity, they would see at once the cause of the very great difference in the illumination.

Mr. A. YUILL (Alloa) said that in his case he believed that the make of oil gas per retort was about equal to the make of four ordinary retorts.

Mr. THOS. GLOVER (Carlisle) was very pleased to hear of this new process for making oil gas. He had watched Mr. Young's process closely—not only from the installations which were put down in Scotland, but also from the experience of the plant which was now working in England. He could confirm all that Mr. West had said about the advantages that Mr. Glover, of St. Helens, had derived from the process. These advantages were not confined to making cheap oil gas; but there was also the great advantage that the manager could buy coal of a lower quality, and that he had a quantity of good coke, too, from it. By means of 3 or 4 per cent. of Peebles oil gas, the illuminating power of the mixture was brought up to about 18 or 19 candles. They in the North of England believed that a gas-flame should have some intensity about it; and although they might not agree that 30-candle gas was the best, they still believed in something better than 14 candles. While many gentlemen were putting forward the regenerative lamp flame as the ideal of what a flame should be for producing lighting effect, he (Mr. Glover) thought they should all be seeking some method for increasing the intensity of the ordinary flat flame. They would thereby be doing better work, and

more good to their industry, seeing that the greatest part of their gas was burned in flat-flame burners. In the Peebles process, the gas was made in the oil retorts during the whole 24 hours; it was not made during two or three hours, and mixed with the coal gas. A small stream of oil gas was continuously made; and it was diffused through the coal gas, so that no stratifying had been found to take place. The difficulties of the old process had been pointed out; and though they were not simply the cracking of the retorts, the loss by this alone was considerable, and they must all admire the ingenuity of the author and inventor of the new arrangement. It was a uniquely simple plant—a retort from which no leakage could take place; internally heated; producing its own coke; no waste of heat in any way; and it was astonishing what a small amount of ground-space the plant took up, and how it could be modified for the production of a large volume of oil gas, as well as being fit to be used for the production of gas of very high illuminating power. All these points were greatly in its favour. He had had the privilege of seeing the plant at Peebles a few days before; and from what he saw of it, it could be put in any corner of an ordinary gas-works, and it would do all the enriching required for a works producing more than a million cubic feet of gas per day. From the figures which he saw worked out, this small plant would make about 50,000 cubic feet of oil gas per day. There was, however, another great advantage; and that was that the layer of fuel could be increased. The plant could thus be used for producing a large volume of water gas, or it might be used with a thinner layer of fuel for producing gas of almost the same quality as was being made by the iron retorts employed at the present time. He ventured, therefore, to predict it would not be long before most large gas-works would have a plant similar to that shown on the drawing to do the work of enriching or to help in dull winter days, by producing a large volume of gas.

Mr. S. W. Durkin (Southampton) asked if it was possible to utilize the process for the conversion of tar made (say) from Durham coal into gas. He saw on the table appended to the paper that splint coal was mentioned. That was the sort of thing they understood; but he should like to know if the process could be adapted for enriching by tar from Durham coal. Anything which could rescue gas men from that dreadful man, the tar distiller, would be a benefit.

Mr. A. Bell, sen. (Dalkeith), said he had had the privilege of seeing the apparatus Mr. Young had described at work the previous week; and he was astonished at the rapidity with which it could make gas, and the facility and ease with which it could be blown up. Of course, in that particular plant, they had but a toy boiler; and it was a very slow process the blowing-up, in the meantime. But even this plant could be blown up in about twenty minutes. With a larger apparatus, or with a forced draught, they could have two or three runs an hour. When he saw the plant at work, the gas was being sent into a small holder of about 5000 cubic feet capacity; and, although he saw only two runs, the holder was blown up fully, and the experiments came to an end—they could store no more gas. They were putting the gas through a small meter when he saw the plant working; and the way that the meter was being driven was amusing—the noise it made. The heating also was not very good. With reference to stratification of the gas, of course Mr. West and Mr. Foulis were speaking of gigantic holders. He knew nothing of them—his holder was only 60 feet in diameter. He, however, directed particular attention to the subject of stratification when he started. At that time he was making a small quantity of coal gas; and he found stratification, in consequence of the large volume of oil gas. But that was only for a day or two; and he had seen nothing of it since. The gases were mixed before they passed through his purifier; and this made the mixture absolute. He did not think the new plant would be suitable for his works, because the quantity of gas it would make would be too great; but for large works, it would be suitable.

Mr. R. Mitchell (Edinburgh) thanked Mr. Young for bringing so excellent a paper before the meeting; it was a subject in which every gas manager ought to be interested. He did not know whether this new plant would be more beneficial to gas companies than was the one which had been before the public so long. Last year, when he (Mr. Mitchell) was speaking at the meeting, he intimated that at their next meeting he might be able to give some statistics as to his working of the process; but his Committee had thought fit to delay the adoption of it in the meantime, so that he could not give any figures. But he thought that what Mr. Young said had been borne out; and he had not the slightest doubt it would be borne out in practical working. It would certainly be a step in the right direction, and tend to keep the cannel coal market in its proper place. There was no doubt whatever that to pay 45s. per ton for first-class cannel, for enrichment, was not worth the enrichment that could be obtained from oil at 50s.—ay, even at 60s.—per ton, as they had it in the market at the present time. Another element which weighed very heavily with some gas managers was the disposal of refuse. The enrichment, generally, that took place in the majority of Scotch works, was by shale, or shaly cannels; and this formed a very heavy expenditure. By the Young process, on the other hand, they had no such thing to contend with. Instead of having refuse to get rid of at an outlay, they got, at an average of 2s. per ton, a coke which formed a source of revenue. He believed that this new departure would be a success, and that it would not only redound to Mr. Young's credit, but that it would be a benefit to every gas manager.

Bailie Mitchell (Greenock) asked if Mr. Young could give any information as to the likely cost of oil. It had been stated by a previous speaker that the cost of oil sent into London was 3¼d. per gallon. Mr. Young might be able to tell them the quality of this particular oil, as compared with the oil he used in his process.

Mr. T. Douglas Hall (Montrose) asked Mr. Young the name of the splint coal from the tar of which he could get gas of 25-candle power. He did not know any splint in Scotland, and few cannels, that would give gas equal to 25 candles.

Mr. Young, in reply, said the questions that had been asked of him were so dovetailed into each other, and they so overlapped, that it was rather difficult to individualize them. However, if he was not able to do so, and to locate them as they should be, the questioners would understand that they were answered, or that they should follow in sequence as closely as he could put them. Mr. West had referred to the mechanical difficulties experienced in the carrying out of the process. No doubt, the mechanical difficulties were, in a sense, a drawback to the introduction of the process. Nevertheless, the principles of the process were undoubtedly sound; and there was no doubt whatever that the mechanical difficulties would ultimately be overcome. Of course, moving about among the different gas-works where the process had been adopted, he had seen what the various gas managers had been doing in that direction. The last time he was in Perth—in fact, the only time he had been there in connection with the arrangements for the process, for he had not yet seen the Perth oil-gas apparatus since it was started, for at the date of his visit they were only working tar in ordinary fire-clay retorts—Mr. Whimster had put a cast-iron sole along the bottom of the retorts, to prevent the tar getting at the brickwork, and thereby prevent the disintegrating effect upon it. He shortly afterwards had a letter from Mr. Whimster, in which he explained that the tar formed over the plate and reached the brickwork in that way; and he regretted to have to report that, so far as the experiment went, it had been a failure. However, he learned from some others that they were trying the covering of the retorts with some sort of enamel. These experiments were still in progress, and with promising results in some respects. Then, again, Mr. Scott, of Galashiels—who was among the first to adopt the process, and whose first retorts, he (Mr. Young) was glad to say, were still working—was working with a semicircular steel plate laid along the whole length of the retort, fixed in position with stud bolts to the bottom of the retort. They would have experience of this mode of overcoming the difficulty at their next annual meeting, as well as the various other little modifications which were being tried, to overcome the other difficulties already experienced; and he had no doubt they would ultimately get the better of them. That brought him now to speak of the best grade of gas to supply. There was no doubt that the material available had a very considerable influence on their decision as to what would be the best grade of gas to be used in any particular district. In Scotland, they had had an abundant supply of cheap cannels up to a comparatively recent date; and, in consequence, they had been in the habit of making a very high quality of gas. In the south, the Durham coal, and coal of that description, had been most easily procured; and it had been used extensively (the desired illuminating power being got by the addition of cannel). So long as cannel remained at a low price, the cost of enrichment was not a serious item; but when cannel became expensive and difficult to obtain, the cost of enrichment was more than the value of the enriched gas to the consumer, and it became advisable to consider whether it would not be possible to get the same amount of light at a smaller cost by consuming a larger quantity of the poorer quality of gas which could be obtained from the Durham coal alone. There could be no doubt that the same amount of illumination could be obtained by the consumption of a larger volume of the lower grade gas; but the quantity of the low-grade gas which would be required to give the same amount of light, would not be proportionate to the lowering of the illuminating power of the lower-grade gas. This was particularly the case with grades of gas under 16 candles; because, as had been shown by Mr. Dibdin, in his recent report to the London County Council—referred to by their President in his address—the illuminating power resulting from the combustion of the lower-grade gas did not fall in an exact ratio, but in an increasing ratio, as the grade of gas was lowered. The conditions were, however, now greatly altered. The cost of cannel had been modified to a considerable extent by the introduction of various processes of enrichment. The cost of enrichment to the manufacturer was far less than the value of enrichment to the consumer; and it was, therefore, very questionable whether it was desirable, under the altered conditions, to modify the quality of the gas being supplied. It perhaps might be as well, just at this point, to refer to the cost of material for enriching by oil. It had been stated to be something over £3 per ton. Now at the recent meeting of The Gas Institute, Mr. Stelfox, of Belfast, read a paper upon the manufacture of water gas; and he there showed that an abundant supply of oil was being obtained at 2½d. per gallon—any quantity of it. He had offers as low as 2¼d. per gallon. His two sources of supply were America and Russia. If oil could be introduced into

Belfast at 2½d. per gallon, surely it could be introduced into London, or any other seaport, on like terms. The supply of oils in their own particular district could, of course, be vastly increased. The oils which the oil companies had been compelled to make in the past had been oils containing a large quantity of paraffin—that being their main-stay as oil producers. But there were large shale fields that could be opened up for the supply of oil suitable for gas making, should a steady demand for such oils be made; and from his own knowledge of the industry, he was perfectly confident that if there was a demand for gas-producing oils, there would be an unlimited supply of oil at little over 2d. per gallon. With regard to the possibility of consuming various grades of gas, so as to develop their full illuminating value, he thought they had already had that pretty well settled. Mr. Hislop, of Paisley, had brought this subject very prominently before them, and had shown them that by suitable adjustable burners they could develop the full illuminating effect of the gas. By altering the angle at which the two orifices of a union burner were placed, they more or less flattened out the flame; and so, by introducing a larger or smaller quantity of air, the conditions was obtained for getting perfect combustion with various grades of gas. Indeed, the only difficulty Mr. Hislop experienced was, not in burning the high-grade gas, but in burning the low-grade gas, because he found that the angle of the orifices had to be so steep, and the pressure at which the gas required to be consumed was so low that considerable difficulty was experienced in getting a really flat flame, and in preventing an excessive quantity of air being drawn into it. He (Mr. Young) might say, in passing, that they in the North were blamed for making gas of so high a quality that, in order to consume it, they required to employ such a pressure that they turned the flame partially into a Bunsen burner. Mr. Hislop found the reverse to be the fact. In the case of high-grade gas, no such difficulty was experienced; but, in order to develop the full illuminating power of low-grade gas, it was absolutely necessary to burn it in an Argand burner, so that they might regulate the current of air and prevent the Bunsen burner action. With regard to stratification of the gas, Mr. Glover had pointed out that, in manufacturing the rich oil gas, it was made over the whole period—at the same time as the coal gas was made. The two gases were manufactured together, and were blended and sent into the same main. Therefore, so long as this took place, there was no danger whatever of stratification. Undoubtedly, if they made the gases separately, and put them into large holders separately, and attempted to use them in this way, there would be some stratification. If they passed first a considerable quantity of rich, heavy gas into a holder, and then a considerable quantity of gas of low gravity, the poor gas would rise to the top of the holder and stratify. He did not think there was any doubt at all about this. Although the law of diffusion was that, the greater the difference in the specific gravity of gases, the greater the rate of diffusing through each other, yet it would take some time before a homogeneous gas was formed. He was very pleased with the remarks by Mr. Foulis, in regard to this plant enabling them to overcome difficulties which he foresaw in the introduction of the Peebles process into large gas-works. He thought his remarks were exceedingly pertinent, and to the point. Undoubtedly, he himself saw the difficulty in introducing the process into works so gigantic as those in Glasgow. The number of taps, the number of fittings, the number of retorts, and the amount of attention required, would have been something enormous. But if by one single apparatus they could do the work of 50 or 60 retorts, it would be infinitely better; and he anticipated, from the little experience he had had of the apparatus before them, that they would be able to get such a result. In regard to the relation between the size of the apparatus and the production of gas, as compared with ordinary retorts, of course the apparatus at Peebles was only a "toy" apparatus in one sense. It was a unit-sized apparatus; and although it was quite capable, he believed, of producing 50,000 cubic feet of oil gas in 24 hours, still it was by no means such an apparatus as would be introduced into large works such as those in Glasgow. Suppose they doubled the diameter of the combustion chamber, that would multiply the capacity by four; and they would require to enlarge its decomposing capacity proportionately. If they were to make it 6 feet in diameter (which was not a very large size), that would simply multiply the production by four, because in the plant at Peebles the combustion chamber was just 36 inches, and the retort 30 inches inside.

Mr. Foulis: Are you not wrong in that? Does it not really depend upon the amount of heated surface to which you expose your gas; and by doubling the diameter, you would only have twice the surface?

Mr. Young: Excuse me; you will find that in my paper I say that at present the relation between the volatilizing effect and the decomposing action of the inside of the retort is fairly balanced; but that, if anything, the decomposing part is in excess. Resuming, he said they could, then, easily understand that if they multiplied the internal area by four, they only doubled the external surface. But they could easily increase the radiating surface of the decomposing retort by making it zig-zag or ribbed (instead of circular) in section, and thus present a greater surface of brickwork, by which the heat would be radiated, at the same time leaving it free, so that the carbon set free in the decomposing chamber would fall on to the surface of the coke, and not be entangled in the brickwork. If chequer-work were used, the whole thing would get choked up every short run, especially when using tar.

Mr. Stewart: If you doubled the height, what would the effect be?

Mr. Young said they would simply double the surface. The height of the retort at Peebles was only 6 feet. The height of a gas-producing apparatus suitable for a large works would be, at least, three or four times that, so that they could easily increase the height, and get the necessary decomposing surface. The difficulty was to get the evaporating surface. The decomposing of the hydrocarbon was apparently easily effected. In fact, Professor Lewes had stated, in one of his papers, that instead of requiring heat to decompose some of the gas-producing materials, heat was actually produced by them; that, instead of the upper layer of fuel being cooled by the process of decomposing these volatile hydrocarbons, they gave out heat, and left the deposited carbon hotter than when the process began. Whether or not he was right in this, was a question; at the same time there was no doubt that Professor Lewes made the statement, and he was perfectly satisfied that, even when heavy oil was used, the quantity of heat required to do the work of decomposing was extremely small. With regard to the percentage of carbon present in relation to the amount of work to be done, Mr. Foulis had pointed out that he required from 30 to 40 lbs. of carbon per 1000 cubic feet of gas produced. Now this was quite true. But, in order to produce the gas they were manufacturing at their Temple works, they had to utilize, at the very least, from 18 to 20 lbs. of carbon in making water gas alone; whereas the apparatus before them was designed with the intention of utilizing the carbon, not for the purpose of making water gas (the object of the apparatus was not to make water gas), but to decompose the hydrocarbon alone. Therefore, all the work they had to do was to decompose the hydrocarbon into gas and carbon.

Mr. Foulis: You said the apparatus is capable of being converted into a water-gas apparatus; and I was pointing out that there was not sufficient carbon.

Mr. Young said he would come to that; it followed in sequence from the remark he was going to make. The primary object of the apparatus was to decompose oils. Therefore all the water gas it was desirable to make was the small amount required to displace the products of combustion, and sufficient to again fill the apparatus, so as to wash out the remaining hydrocarbon vapours. That was the process in its simplest form, and the object for which it was originally designed. For this purpose, he might remark, it could easily be seen that a very much smaller quantity of carbon was required, because all that was needed was simply to do the volatilizing of the oils and to convert them into gas. In the case of hydrocarbons containing a large quantity of fixed carbon, there would be a surplus over what would be required. But suppose it were desired to convert it into a water-gas process, or a water and oil gas process, and that there was not a sufficient surplus carbon from the oil or tar, and they required to use extraneous carbon. In that case, by filling up the decomposing portion of the plant for a considerable part of its length, they would get a deeper layer of carbon; and, besides, they would not only be heating the carbon (not by the products of combustion of the carbon) to carbonic oxide, as had hitherto been the case, but also by external heating from the outside of the retort, by the combustion of the carbonic oxide to carbonic acid in the secondary air supply. The heat so produced would then pass through the walls into the retort; and by this means they would raise a much larger quantity of carbon to the high temperature necessary to make water gas. In this way, if they were using a compensating gasholder, they could make water gas for a time; then change the process and for a time make oil gas; and the two gases would pass through the compensating holder into the same storeage holder, and get mixed there.

Mr. MacPherson: What about stratification then?

Mr. Young said it was quite true there might, under such conditions, be stratification unless time were allowed for the gases to mix. The apparatus might, however, be worked in a similar manner to that described by Professor Lewes in his apparatus—by simply injecting the hydrocarbons, and allowing them to pass into the mass of hot carbon; thus making water gas at the same time that the hydrocarbons were run into the mass of hot material. The only remaining note he had was with reference to the production of gas from coal tar. They had had various tars, and found that by their process they could all be easily converted into gas. Mr. Terrace, of Middlesbrough, had kindly sent him a sample of coal tar from Durham coal, which he had no difficulty whatever in gasifying. He did not remember the exact illuminating power of the gas they obtained from it.

Mr. Terrace: It was 24-candle power, and the coal did not yield over 16-candle gas.

Mr. Young said it would thus be seen that, from a coal that would yield 16-candle gas, the tar yielded 24-candle gas. There was no doubt that it could be done, and done most efficiently. They had not had a bit of difficulty, in any way, from the deposit of pitch or soot in the apparatus. He might say that the bend in the hydraulic main had never, so far as he was aware, been cleaned out; never a rod put into it. The excess

of hydrocarbon in the form of condensable vapour going into it was sufficient to wash away any deposit. He could not say how much gas they had made. The make of gas at Peebles was so small that, by the apparatus, they made all the gas they needed in two or three hours. It was out of all proportion to the size of the works. The meter they measured the gas with, as Mr. Bell had said, groaned. They could, however, measure it by the large meter. He thought these nearly all the points he had to answer; but if there was any other point, he would be very pleased indeed to answer it. His reply with regard to the illuminating power of the gas from Durham coal tar would apply to their splint coal, because the splint coal yielded fully better than 16-candle gas. As a rule, they got 17 candles; and that would account for the 25 candles which they could get from the tar of splint coal.

The PRESIDENT said that Mr. Young's name had been long and honourably associated with the oil trade; and he had made many improvements in their own industry. Mr. Young had certainly supplied them with a very good apparatus for enriching coal gas in small gas-works, as was shown by the paper he read on a previous occasion; and in the paper they had just heard, with probably a few improvements (which he had no doubt Mr. Young, with his ability, would soon effect), he felt that they would have a most excellent system for manufacturing, or enriching, gas on a large scale. It was a pity for the extraordinary members connected with the Association, that their business should be done away with in this way; but, if Mr. Young succeeded, there would be no use for the ironfounder, and very little for the retort manufacturer. There was, however, one way where the public could be gainers—that was in having cheaper gas. He thought that if they were in the position of awarding the Birmingham Medal, they could not select a better recipient for it than Mr. Young. He had now to ask the meeting to accord Mr. Young a very hearty vote of thanks for the enjoyment he had given them that day.

Mr. YOUNG: Allow me to thank you, gentlemen, for the very kindly expression of your opinion.

DISCUSSION ON MR. GALLOWAY'S PAPER ON "INCANDESCENT GAS LIGHTING."

Mr. D. TERRACE (Middlesbrough) opened the discussion on the above paper. He said that last winter about 1000 of these lights were introduced into their town; and he had the testimony of one of his consumers, who used to have an account for £3 13s. at one of his places of business, that he had, by means of the incandescent gas-lights, reduced it to 13s., and thus saved £3 per quarter. He knew that there was a great deal less heat generated by these lamps; but it was a question with him whether the open flame which they usually saw was not more hygienic than the Bunsen flame of the Welsbach lamp. He would like Mr. Galloway to say whether, in converting the white flame into a blue one, they were not producing more noxious gases. As to dirt, they all knew that a certain amount of dirt might be produced by smoke only. But dirt as dirt was merely dust particles; and in connection with the incandescent burner, it was just as likely to collect upon the ceiling as with other burners. He had listened with great attention to the paper. It was a very able one; and he thought it quite right that the Association should have such a paper.

Mr. T. DOUGLAS HALL (Montrose) thought they were all very much indebted to Mr. Galloway for his concise and able paper. One point struck him very forcibly on hearing the paper. They had heard a great deal that day about the advantages of high illuminating power gas. Their worthy President had always stuck up for gas of high illuminating power; and as he said (and they all said), they did not want to sell gas, they wanted to sell light. But it seemed to him (Mr. Hall), as far as he had seen of this comparatively new burner, that they would be going on the proper lines if they consumed gas in this manner, by incandescence, instead of making gas of high illuminating power from oil. The very fact that from 2½ cubic feet of gas per hour—the highest quantity that the burner could almost be made to consume—they could develop an illuminating power of something like 35 to 40 candles, and that Mr. Galloway had assured them that from 16-candle gas they could get the same results as from 18 to 25 candle gas, well, if that was the case, he (the speaker) failed to see the necessity for manufacturing gas of high illuminating power. The same remark applied to cooking. Mr. Main said they could get the same results from a low as from a high quality gas. One of the finest installations of the incandescent gas-light he had seen was in the city of Glasgow; and it would be worth while for the members to visit the place and see it for themselves. He referred to the Corporation Picture Galleries in Sauchiehall Street, where they could see the two styles of lighting—by the ordinary flat-flame and by the incandescent burner—almost side by side. The result, he must say, was very startling.

Mr. P. WATSON (Stirling) said that fully twelve months ago a flaming circular came to them, setting forth the benefits of the incandescent gas-burner. He was much taken with it; and having got permission, a lamp was fitted up in the house of each of his Directors. He put one of them on an experimental meter, and found it consumed 2½ cubic feet of gas per hour; and the photometer gave 28 candles. He was perfectly delighted with the lamps. Unfortunately, however, the glass chimneys broke, and broke the mantles; and there was now only one of the burners in existence. This was his individual experience. Perhaps there might have been great improvements since he bought the lamps; and if he thought they were suitable for street lighting, he would certainly get more yet.

Mr. A. MACPHERSON (Kirkcaldy) had had some little experience of incandescent gas-burners. They had been successful in introducing a very considerable number of them into their place; and they were giving universal satisfaction. They had not the difficulties that Mr. Watson experienced. They had, of course, had a few glasses broken; but that was only what they might expect. Where care was taken to see that the glass did not fit the lamp-base too tightly, he did not think they need fear breakage. He had recently proved the lamps himself; and the claims of the Company were not over-stated. There seemed to be some mistake, however, with regard to the 15 or 16 candle gas, and the rich gases. Surely Mr. Galloway was in error when he said that his only trouble was with 30-candle gas. Certainly 30-candle gas would be as useful for incandescent gas lighting as 15 or 16 candle gas; and surely they would use a smaller quantity of it. If they used 2½ cubic feet of a rich 25-candle gas, with 15 or 16 candle gas they would use (say) 3½ or 4 feet. The greater amount of carbon in the richer gas would certainly heat up the mantle with greater efficiency than the same quantity of 15 or 16 candle gas. At the same time, he had found the truth of the statement that to use more than about 2½ cubic feet per hour was injurious to the light; and therefore he thought it was well that these lamps should be fitted with suitable regulators. They sometimes had had complaints, until people understood them, that there was something wrong with the lamps; and they found that it was neither more nor less than an over-supply of gas. He must say that the Incandescent Gas-Light Company had put a weapon into their hands as gas managers with which they would successfully fight the electric light.

Mr. S. W. DURKIN (Southampton) had been much interested in the paper which had been read. There was a place near his town where they had been using oil for street lighting for some time; and there his friend the gas manager had been experimenting with incandescent gas-lamps, and had been very successful. About the same time, he himself started a small experiment of his own in street lighting. For this purpose he selected a spot in the upper part of the town. There was a large space in the centre of the road where there was formerly a 90-candle lamp, with flat-flame burners. These he displaced, and put in six incandescent lamps, each using 4 cubic feet of gas per hour. The illuminating power had been increased from 90-candle power, effective, to about four times that amount, for the same quantity of gas per hour. The incandescent lamps were also coming into use very much for private lighting in the South of England. He might say that he used mica chimneys, and lanterns with a ventilated inlet and outlet at the top, in which there was no draught.

Mr. D. VASS (Portobello) said he could bear out a great deal of what Mr. Galloway had said; but there were one or two points which were not clear to him. He recently made an experiment on the photometer, and obtained 22-candle power when burning 26-candle power gas at the rate of 2·8 cubic feet per hour; and his experience was that, on turning on more gas, they had a reduction of illuminating power. He looked into this question, and he thought it was one that Mr. MacPherson had touched on. The mantle was supposed to be suspended in a Bunsen flame; but if they suspended anything in the centre of a flame, it would not be illuminated at all. It therefore came to be a question of the size of the flame. If the flame did not strike on the mantle, they did not get illumination. He thought that this was the mistake that was sometimes made when it was said that 25-candle gas did not give better results than 18-candle gas. Mr. Galloway used the burner with gas costing 2s. 8d. per 1000 cubic feet. This, however, was rather misleading to most of them. He also thought that electricity at 8d. per unit was rather a high figure.

Mr. J. WEST (Manchester) asked if low-grade and high-grade gas (the same quantity being consumed) had been tried in the burner; if so, what were the relative advantages of one over the other? For instance, had Mr. Galloway used 16-candle gas, consuming 2½ cubic feet, and Scotch gas of 30-candle power consuming the same. If so, what were his results?

Mr. W. YOUNG (Peebles) said he looked upon the incandescent mantle very much as he would look upon a gas-engine; it was a means of converting heat into another form of energy. Instead of converting it into mechanical energy, they converted it into light; and therefore he should say that the heat of the gas would be very much what its lighting value was in an incandescent burner. It would depend very much, however, upon how the gas was used. If a Bunsen burner were supplied with an excess of gas, the unit value would fall; and he thought it would be found that, because of the luminosity being heat, the heating power of gas would be the measure of its luminosity.

Mr. J. MAYER (Glasgow) said he had Mr. Foulis's permission to refer to the installation of incandescent gas-light in Glasgow. There were ten lamps in the installation; some of them devised to consume 3½ cubic feet of gas per hour, and the others 5 cubic feet. The Inspector of Lighting was very pleased indeed with the lamps; but he thought the 3½ cubic feet lamps would have to give place to 5 or 4¾ cubic feet lamps.

Mr. A. WILSON (Dawsholm, Glasgow) said when they made an experiment, they got 84-candle power out of 4¾ cubic feet of gas.

Mr. GALLOWAY, replying to the remarks made, said that no carbon was given off by the flame; and so far as he knew, no noxious gases had been found to be given off. The difference, when the burner was tested with 15, 18, or 25 candle power gas, was only one candle per cubic foot of gas consumed. The burners were fitted with regulators which could be had if required. In Edinburgh, the cost of gas when burned by their lamps would be one-twelfth what the Corporation proposed to charge for electricity. If there was too much gas going through the burners, they would not get the flame into the mantle; and, of course, they would not get light. For the street lighting experiment in St. Vincent Street, Glasgow, the burners were specially made—the mantles were entirely different, and so also was the construction of the lamp.

The PRESIDENT, in closing the discussion, said that Mr. Galloway had given them a very concise and interesting paper. If every gas consumer in the country could be induced to purchase highly expensive burners—both the regenerative and the Welsbach—probably the question of the quality of gas would not be of so much account; but gas managers had to take things as they were, and at the present time a very large percentage—indeed, he would say three-fourths—of the gas which was manufactured for lighting purposes was consumed in flat-flame burners. They would have to wait until the time came when consumers of gas would probably see it was to their interest to purchase high-priced burners; and when they had them, they would have to give them some little attention, because in the hands of careless people, the Welsbach burner could never be a success. He asked the members to accord Mr. Galloway a very hearty vote of thanks.

This was done, and the members proceeded to dispose of the remainder of the business, as already reported.

ANOTHER IMPROVED ATMOSPHERIC GAS-BURNER.

It may be within the recollection of regular readers of the JOURNAL that at the recent meeting of the Incorporated Gas Institute, on the occasion of the reading of Dr. Voisey's paper descriptive of his new pattern of atmospheric burner, Mr. A. P. Main, of Glasgow, offered some remarks with the object of establishing a claim to the possession of a burner of this order which was incapable of firing-back as Dr. Voisey's, while of simpler construction. In our "Register of Patents" to-day will be found an abstract of the specification, and a reproduction of the filed illustration of the appliance referred to by Mr. Main; and we make special mention of the invention here in order that the patentee, Mr. R. B. Main, may receive as full a recognition as we can afford of the indubitable merits of his ingenious and simple device. Moreover, the construction of the working atmospheric burner, as used in gas fires, kitcheners, &c., has remained so long without sensible improvement, that we are glad to signalize every promising attempt to remove from it any of the reproaches that have been levelled against it.

As will be seen from the patent illustration, Mr. Main depends for the proper action of his new burner upon the operation of perforated metal or gauzes fitting into the jets or nozzles of the burner. These gauzes are removed from the point of combustion; and so they are protected from the well-known troubles incidental to wire-gauze covered atmospheric burners, which are, of course, of very odd construction. The burner nozzles are bell-shaped, for the reception of the wire gauzes, which have turned-up edges, and fit of themselves into their seats. We have had a sample of the new Main burners under inspection, and can vouch for the fact of their being practically exempt from liability to fire-back under the most severe tests (much more severe, indeed, than would ever be met with in ordinary usage); while they burn with very little audible sound. Compared with ordinary atmospheric gas-burners, they may be truly styled "noiseless." In so far as regards construction, the burners are as good as anything at present in the market, and better than most; and they should certainly go far to remove some of the gravest objections hitherto raised against gas-fires by nervous householders.

British Association for the Advancement of Science.—The meeting of this Association opened in Oxford last Wednesday with the usual address by the President for the year—the Marquis of Salisbury; and on the following day the work of the sections began. The President of Section B (Chemistry and Mineralogy) is Professor Harold B. Dixon, F.R.S., of Owens College, Manchester; and in his address he dealt mainly with the researches of Boyle, Hooker, and Mayow into the phenomena of fire and water, and also urged that research work ought to be included in the systematic training of students. In Section G (Mechanical Science), Professor Kennedy discussed the critical side of mechanical training. Among the papers upon the programme for last Saturday, was one by Mr. Bryan Donkin on "The Most Economical Temperature for Steam-Engine Cylinders;" and Mr. H. Davey was down for one on "Borehole Wells for Town Water Supply."

REGISTER OF PATENTS.

Automatic Gas-Meters.—Brownhill, R. W., of Aston, Birmingham No. 12,184; June 21, 1893.

This invention relating to improvements in automatic sale and delivery coin-freed attachments for gas and liquid meters, is an improvement upon, or an amplification of, four patents granted to the same patentee—No. 7012 of 1887; No. 20,583 of 1889; No. 5378 of 1891; and No. 13,181 of 1892. The present invention has for one of its objects "a new price-changer, whereby ratchet-teeth in the changing mechanism are dispensed with; another of its objects is the differential speeding of the index-finger and disc-wheel; and another of its objects is "the simplicity of the construction of the general mechanism, with reduction of the cost of production."

Fig. 1 represents the front elevation (with the enclosing casing in section) of an automatic meter attachment made according to this invention. It shows the handle or turn of the principal axis; also the range arm and stop of the price-changer, and the means for varying the position of the arm relative to the range-stop, so as to determine the number of cubic feet of gas to be delivered to the payee. The view also shows the valve and the arm for operating it. Fig. 2 is a back elevation of the attachment, with parts in section. This view represents the coin-shoot, the quantity-wheel, the operating lever, and portions of the clutch mechanism. Fig. 3 represents a complete side elevation of the attachment, with nearly the whole of the component parts. Fig. 4 is a longitudinal vertical section of fig. 1; showing the component parts of the attachment, and the transmitting gear. Fig. 5 is a cross section of the quantity-wheel and its clutch; also the back-stop, for limiting the retrograde movement of the clutch mechanism.

The main axis, supported by suitable framings, carries upon, and has made fast to it, a turning handle D at one end, and a hook-ended and double-armed lever E at the other end, and a range-arm F of the price-changer near the handle end. There is an oscillating extension of the coin-shoot G, open top and bottom; while the sides of its lower end are gapped sufficient to make a complete clearance for the passing through it of the hooked end of the lever E, turning with the end of the axis A, on the lever making a part rotation when no coin is in the coin-shoot extension. The shoot extension carries a counterpoised excess lever H, jointed to a bracket carried by the walls of the extension, and with its upper and curved end normally lying without the path of the mouth of the shoot extension, but with the tail end normally lying within the throat of the extension. In this way, when a coin is dropped down the shoot, it gravitates into the lower part; and in running down, it strikes against and presses outwardly the tail end, and at the same time turns inwardly the other end across the open mouth of the shoot extension. The coin then comes upon the rest ear or extension of the fixed bracket I, which lies partly within the path of the lower open end; and the excess lever is thus blocked in its mouth-closing position, by the upper part of the coin resisting in front of the tail end. The lever E, which is fast upon the principal axis A, has a stop-arm, which takes its abutment against the back wall of the shoot extension, and limits the backward movement of the principal axis and the lever and the parts carried by the axis.

The clutch mechanism, which makes the connection between the principal axis, the coin-shoot extension, and the quantity or measuring-out wheel J, consists of a link with the inner end joined to a stud on one of the sides of the shoot extension, and with its other end jointedly connected to a clutch-lever K, pivoted to a rising and falling carrying-bracket, mounted upon the main axis; while the bearing contact of its short arm or heel comes against the plain periphery of a disc wheel, which has made fast upon its axis (working within bearings of a fixed bracket carried by the rising and falling arm) a pinion, which intergears with the teeth of the quantity or measuring-out wheel J, having a bushed or bearing sleeve made fast with it, and formed integral with a toothed sun-wheel having 41 teeth, and forming the driving-wheel of the epicyclic train. This wheel intergears with one pinion of a planet-twin-pinion M, whose axis is directed through a bush or hollow axis, made integral with the meter tangent wheel. This is loose upon the main axis A, and is driven by a worm rotated from the meter drum by the impelling force of gas passing through the meter.

The second pinion of the twin planet pinion M, each of which has 15 teeth, intergears with the teeth of a second toothed sun-wheel having 40 teeth, and made fast to the hollow neck or sleeve carrying the disc-wheel N, and having a notch with inclined sides (wherein a tooth or stud of a valve-operating lever S engages), and with the forward necked extension having made fast to it a pointer, which traverses the face of the graduated dial O, which is marked off into a scale indicative of 300 or other number of cubic feet of gas, and is made fast to the general framing of the attachment. Located between the framing and the face of the quantity-wheel J is a spring friction-clutch P, for holding the whole of the gear-wheels and components stationary while the meter-wheel is being rotated by the impelling force of gas passing through the meter, and while the planet pinions are rolling round the toothed peripheries of the sun-wheels, and effecting the necessary reduction in the speed of the disc-wheel N and pointer.

The too-free movement of the shoot extension is obviated (or it is made stiff in its movement) by the free end of a pressure spring or lip Q, pressing against the side of the framing of the attachment. The clutch mechanism is limited in its back movement by a stop carried by the general framing; while the clutch-lever K is also limited in its backward movement by a stud carried by a rocking or rising and falling bracket.

Situated under the outlet of the coin-shoot extension, and under the coin-rest of the bracket I, is a trough R, down which coins slide into the coin-box or receptacle placed within the interior of the casing of the meter. The back end of the valve-operating lever S is connected to the valve by the joint located within the valve-chest, and adapted to open and close the gas-way of the service.

In the price-changer, the range-arm F has an adjustable stop, consisting of a screw which worms in and out of the screw-box, made through the end of the arm for fine adjustment of the range. T is a rotating price-indicating dial—having pence graduations and numerals upon it, and being mounted loosely upon the axis A, and integrally

Fig. 1.

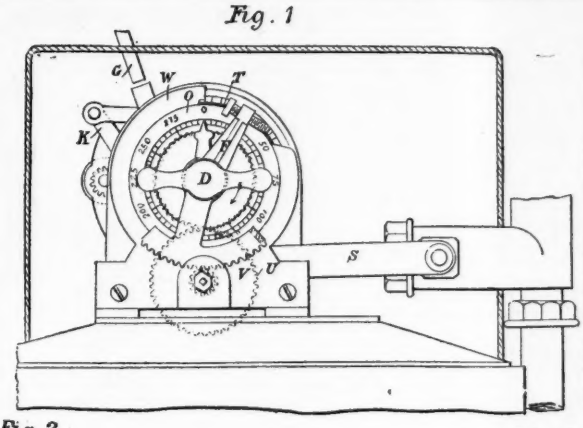


Fig. 2.

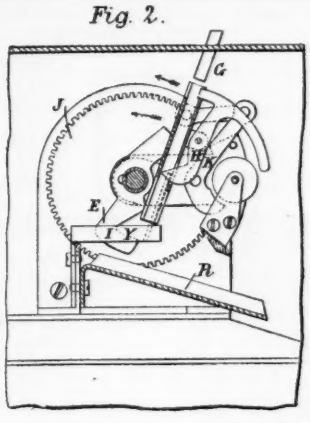


Fig. 3.

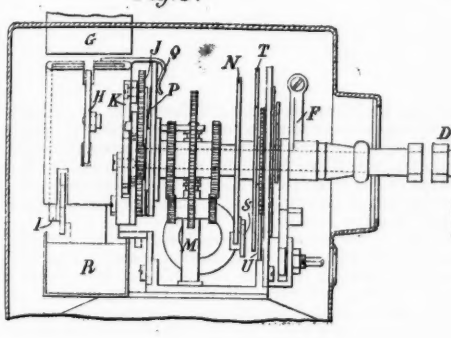


Fig. 4.

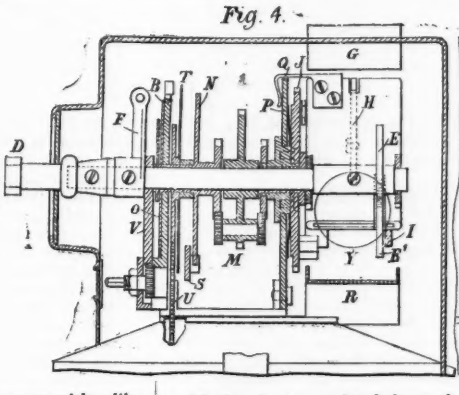
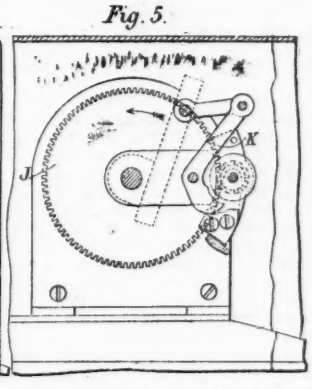


Fig. 5.



connected with a toothed pinion, which latter intergears with a like pinion U, made secure to a supplementary axis carrying fast upon it a pinion which intergears with the teeth of a toothed sector V, also mounted loosely upon the axis A, and being provided with a forward stop, whose position determines the motion of the range-arm F, and thereby indicates, according to the range, the amount of gas to be apportioned out to the payee. Thus, supposing that gas is 2s. 11d. per 1000 cubic feet, then the dial T is rotated until the numeral 35 comes opposite the termination of a mask or wing W, gapped so as to allow a portion of the price-indicating dial T to be seen. In making an alteration in the price-changing mechanism consequent upon a change in the price of gas, an official breaks the seal, and then (by a key) adjusts the position of the range-stop relative to the back-stop of the range-arm; and after adjustment, he forces the clamping plate home, thereby preventing the dial T and the quadrant stop from being changed or tampered with by consumers.

Assuming the price-changer is sealed in a position adapted to deliver gas in pennyworths at the rate of 2s. 11d. per 1000 cubic feet, then to adjust the changer to apportion out pennyworths of gas at the rate of 3s. 4d. per 1000 cubic feet, the official would proceed as follows: He would break the official seal, and slacken the nut and clamping device; then insert a key, and rotate the axis which turns the wheel U until the numeral 40 upon the dial T comes linable with the indicator. At the same time, a pinion engages with the teeth of the toothed sector V, and turns it from left to right; and with it the range-stop is so turned as to decrease the distance between the back position of the range-stop arm F, and the forward range-stop. In this way, less gas is apportioned out to the consumer consequent upon the rise in the price of gas. From this it will be seen that, by changing the position of the dial T, the motion of the range-arm F is decreased or increased; and the quantity of gas apportioned out to the consumer is increased or decreased accordingly, and the winding-up mechanism is moved through a greater or less range on the turning of the handle on a penny or a succession of pennies being introduced.

Assuming that the whole of the parts are in their normal relative position (as shown), and assuming that a coin Y has been dropped down the coin-shoot G, in its traverse, it strikes against the tail end of the excess lever H, and presses the end out of its path. The coin then falls upon the rest of the fixed framing I (see dotted lines in fig. 2), while the top part of it holds the excess lever back, and keeps the other hooked end across the mouth of the coin-shoot extension until the coin has been liberated. In this way, excess coins are prevented from being introduced into the shoot until an equivalent in gas to the one previously tendered has been placed (so to speak) to the credit of the payee.

The introduced coin couples together the apportioning-out parts of the mechanism, and the continued motion of the handle turns the shoot extension forward, with a free movement upon its bearing centres, and at the same time turns the clutch-lever K backwards upon its axis. When the shoot extension has assumed a nearly vertical position, the bearing face of the short arm of the lever is brought up to the plain periphery of the wheel, and by the frictional contact of the surfaces thus brought together the motion of the pinion is arrested, or the pinion is held fast, and so also is the quantity-wheel J intergearing with it. The result is that, on the still continued rotation of the handle, the whole of the parts (less the meter-wheel and its twin pinions) are bodily moved back together, until the motion is arrested and the parts blocked from further progress, by the end of the pin of the range-arm F coming against the forward range-stop of the toothed sector V of the price-changer.

Motion is transmitted from the quantity-wheel J to the notched disc N through a sun-wheel, which drives the pinion and communicates motion to a pinion, which in turn communicates its motion to a second sun-wheel at a considerably reduced speed, and through the sleeve of this pinion to the disc-wheel N and finger. By this rotation of the disc, its notch is taken away, so as to turn the lever S outwardly upon its joint and take the valve from its seat in the valve chest, and so open the gas-way in the service.

The handle is then turned in the reverse direction, when the whole of the mechanism for a time remains, and is kept quiescent by the friction-clutch P, located between the quantity-wheel J and the adjacent walls of the upright framing. As the motion is continued, the axis has a limited free movement, which takes the hooked end of the lever E (fast on the end of the axis) from under and without the range of the coin Y; and immediately the hooked end comes clear of the coin (as in fig. 2), the coin falls on to the inclined trough R, and from thence slides into the coin-box.

Directly the coin is released, the short-arm of the lever E comes against the back of the oscillating coin-shoot extension, which is then carried forward and with it the link and the clutch-arm K and the acting and gripping face of its short arm is moved, so as to release the clutch from its engagement with the quantity-wheel; and as the clutch mechanism and the shoot extension and the parts carried by them are brought back to their normal position, the pinion rolls over the teeth of the periphery of the quantity-wheel, until the arm carrying the clutch mechanism is stopped by coming against the forward range-stop, so that the range of motion of the mechanism is between the fixed stop and the adjustable stop.

The meter drum now being impelled round by the pressure of gas passing through the service, communicates rotatory motion to the worm axis, at the rate at which gas is being delivered and consumed; and rotary motion is transmitted from the axis to the meter-wheel. As the first sun-wheel (having 41 teeth) and the quantity-wheel J remain quiescent, the pinion rolls around the toothed periphery of the wheel, and through it the twin pinion M is rotated and its pinion is made to roll upon the toothed circumference of the second sun-wheel, having 40 teeth. This turns the disc-wheel N around backwards to an extent equal to one tooth to every complete rotation of the meter-wheel. The notch in the disc N has now been brought back to its normal position, and the tooth or stud has passed again into the notch. Then by the angular movement made by the valve-operating lever S, gas is cut off by the closing of the valve; and the payee has had dealt out to him an equivalent in gas for the coin deposited.

On introducing a second coin into the coin-slot, the same operations are repeated; and on the introduction consecutively of further coins, after each preceding coin up to twelve has been placed to the credit of the payee on the dial, the return movements of the mechanism are operated only as the consumption of gas is effected; and until the notch in the disc has been brought back to its valve-closing position, and coincident with the stud on the valve-arm, so long will the attachment be at liberty to deliver the gas due to the payee as it may be required.

Distilling or Cracking and Gasifying Hydrocarbon Oils.—Caldwell, H. M., of Russell Square, and Tatham, E. and J. E., of Lewisham. No. 13,163; July 5, 1893.

This invention has for its object to provide means whereby the subjecting of hydrocarbon oils and the like to distillation (referred to for brevity as oils), for cracking and gasifying them, can be carried on in a more efficient manner than hitherto.

Fig. 1.

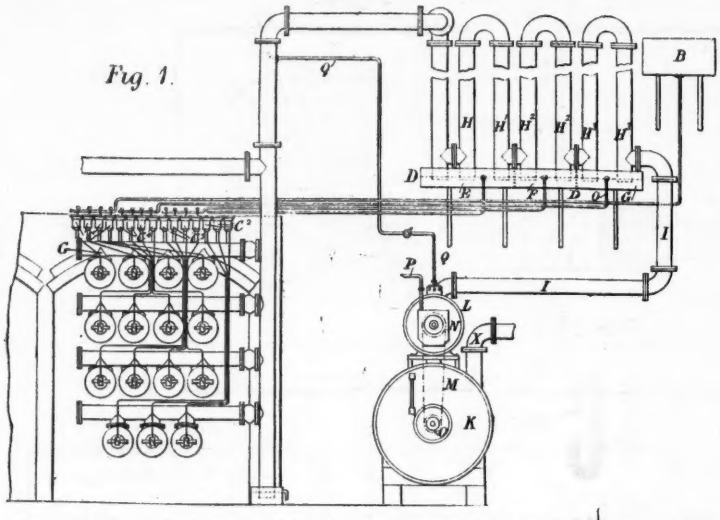


Fig. 2

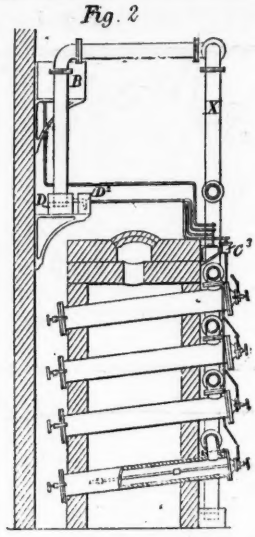


Fig. 3.

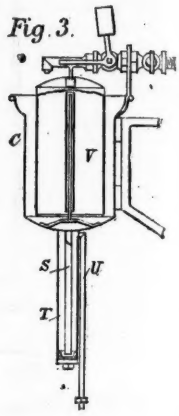


Fig. 1 is a front elevation, and fig. 2 is a transverse section, of apparatus constructed according to this invention. Fig. 3 is a sectional elevation of the device for automatically cutting off the supply of oil to the distilling retorts or vessels.

The retorts in which the oil is cracked and gasified, are arranged in tiers one above another (preferably inclined, as shown in fig. 2), so as to be heated to different degrees of temperature—the lowermost tier, nearest the furnace, being heated to the highest temperature; the next tier above, to a lower temperature; and so on. B is a tank containing the oil to be gasified. It is conducted into feeding-devices C (one of which is shown in section in fig. 3), from which it passes into the upper ends of the top tier of retorts, and so on to the lower ends of the retorts. On the oil being cracked, or partially distilled, the gas generated passes into a pipe communicating with an ascension-pipe X, which leads to a condenser, in which the heavy products from the distillation of the oil deposit.

The condenser is situated above the bench of retorts. It consists of a vessel D arranged horizontally, and divided into separate compartments E F G; the number of compartments depending upon the number of tiers of retorts. Into the first compartment E dips the ascension-pipe X, into which compartment also dip the two ends of an inverted U-pipe H, one leg of which communicates with the pipe X; while the other leg communicates with one leg of a similar inverted U-pipe H^2 dipping into the compartment F in the vessel D. The other leg of the pipe H^2 communicates with one leg of an inverted U-pipe H_3, dipping into the third compartment G in the vessel D; while the other leg of the pipe H_3 is in communication by a pipe I with a gasholder or with a meter K, through which the gas passes from the condenser to the holder. The heavier products, which pass with the gas from the retorts, deposit in the compartment E of the condenser, and pass therefrom into feeding-devices C^2; and thence into the bottom tier of retorts, which are subject to the greatest heat.

In these retorts, the products are again distilled; the gas generated passing into a pipe leading to the ascension-pipe X, and thence to the condenser, as before. The next lighter products of the distillation deposit in the compartment F of the condenser, and pass therefrom into a pipe by which they are conducted to feeding-devices C_3, and thence into the second tier of retorts, which are not heated to so high a temperature as the lowest retorts. The gas generated by the redistillation of the products in these retorts passes into a pipe communicating with the ascension-pipe X, through which the gas passes to the condenser. The lightest products of distillation deposit in the next compartment G of the condenser, and pass therefrom into feeding-devices C_4; and from thence into the third tier of retorts, situated in a cooler part of the furnace. The gas generated by redistillation of the products in these retorts passes therefrom into a pipe, conducting them through the ascension-pipe X to the condenser.

The whole of the gas passes from the condenser by the pipe I into the meter K, and is conducted therefrom by a pipe Y to the holder, or it may pass to the holder direct. The deposited products either pass direct from the vessel D of the condenser into the pipes shown, or they may pass from the vessel D into another similarly divided vessel D^2, with which the pipes are connected.

A regulated supply of oxygen may be admitted to the apparatus, to mix with the products of distillation in the condenser in their passage from the retorts to the condenser. A convenient arrangement for supplying the oxygen consists of a meter L, operated from the meter K, by means of an endless chain M passing round sprocket-wheels N and O fast on the axes of the meters. The relative sizes of the wheels N and O are regulated according to the proportion of oxygen required to be mixed with the products of distillation. Oxygen enters the meter L by the pipe P, and passes out therefrom by the pipe Q, which conducts it into the interior of the ascension-pipe X, to mix with the products of distillation passing through this pipe.

A feeding-device is provided for each retort, consisting of a vessel C (see fig. 3), into which the oil from the tank B or the deposited products from the condenser D, as the case may be, enters, and passes through a tube S depending from the bottom of the vessel into an outer or surrounding tube or chamber T. The oil and products pass from T at the upper end into a pipe U, leading to the interior of the retort with which it is connected. Inside the vessel C is a float or inverted bell V, upon which rests one arm of a weighted lever, carried on the axis of a cock on the pipe by which the oil is conducted into the vessel. Should the outlet from the retort become choked, the gas will ascend by the feed-pipe U; and, by pressing on the liquid, will cause the float to rise, and turn the cock until the weight on the lever overbalances and closes the cock so as to cut off the supply of liquid to the vessel. The pipes through which the gas passes from the retorts to the ascension-pipe X, and also the pipes which conduct the oil and the deposited products of distillation into the feeding-devices C, C^2, C_3, and C_4, are provided with stopcocks so that any of the tiers of retorts may be shut off when required.

The claims for the invention are: (1) Distilling or cracking and gasifying hydrocarbon oils and the like, by subjecting the hydrocarbon oil or the like, and the deposited products of distillation from the oil, to different degrees of heat, according to their specific gravities, in retorts or vessels which are heated to different temperatures. (2) In apparatus for distilling or cracking and gasifying hydrocarbon oils and the like, the combination with retorts or vessels, in which the distilling and gasification is effected of a condenser having separate compartments into which the heavy products of distillation deposit according to their different specific gravities, and pipes or passages for conducting the deposited products from these compartments into retorts heated to different degrees of temperature—the heaviest deposited product being conducted to the hottest retorts; the next lighter deposited product, to the retorts heated to a lower temperature (the next lighter product being conducted to the retort or retorts heated to a still lower temperature); and so on.

Gas Motor Engines.—Fiddes, A. and F. A., of Bristol. No. 13,518; July 12, 1893.

The object of this invention is to increase the power of gas-engines, and to lessen the consumption of gas, "by causing a charge of pure atmospheric air to pass through the working or back-end of the cylinder while the piston is driving out the burned gases, and thus render the air left at the back of the piston comparatively pure; also to send a similar charge of pure air (slightly diluted with gas, if necessary) into the cylinder while the piston is compressing the charge of air and gas admitted through the inlet-valves."

The difficulty with gas-engines up to the present time, the patentees remark, has been how most effectually to exhaust the burned gases left in the cylinder after each explosion; and the exhaust appliances at present in operation are only able to remove about two-thirds, leaving one-third of the deleterious mixture in the cylinder to depreciate the next charge. By their invention, a considerable volume of pure air is pumped into the back of the cylinder, at the same time that the rear of the piston is driving the burned gases through the exhaust-port, which will necessarily result in the expulsion of the foul air, and its place being supplied by pure air; while a charge of air can be sent into the cylinder while the gas and air therein are being compressed.

The invention may be carried into effect by attaching an ordinary air-pump near the cylinder of the engine, and operating it by an eccentric or crank from the central shaft. But this involves a division, and consequent loss of power; so it is preferred to surround the piston with an annular air chamber, formed by an elongation and enlargement of the cylinder and also of the piston. The space between these two enlargements is opened and closed at each revolution of the crank-shaft, sending a charge of pure air to clear out the burned gases, and also to surcharge the explosive mixture.

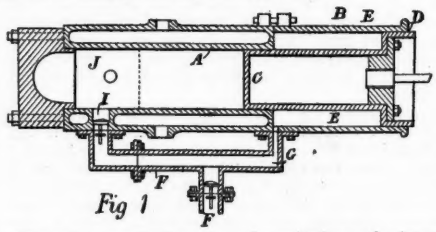


Fig 1

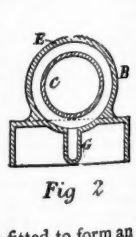


Fig 2

Fig. 1 is a vertical section of a cylinder and piston fitted to form an air chamber and pump; and fig. 2 is a cross section, showing the piston and enlarged cylinder—the space between being the air chamber. Fig. 3 is a vertical section, and fig. 4 a sectional plan of part of a gas-engine, with the water jacket round that part of the cylinder where the explosions are made. The usual appliances for the inlet of gas and air, and for the discharge of burned gases, with cams and gearing from the secondary shaft for regulating the same, are shown; but only such

parts are described in the specification as are necessary to show the nature of the improvement claimed, which is essentially "the cleansing of that portion of the cylinder in which the burned gases are driven by the back-stroke of the piston, and forcing an additional quantity of air into the cylinder, and compressing it at the same time that the charge of gas and air is compressed."

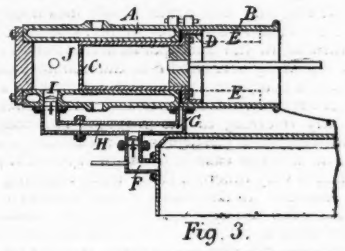


Fig. 3.

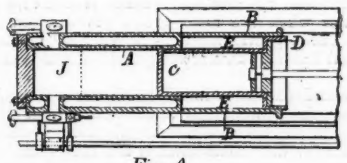


Fig. 4.

A is an ordinary cylinder, extended and enlarged at B. C is the piston (also extended), which operates in the cylinder A. At the extreme end of the piston is an enlargement D, which operates in the enlarged cylinder B; and as the piston moves forward, an annular space E is formed and enclosed between the piston and cylinder. F is an air-pipe, attached over an aperture in the stand or other convenient portion of the engine, fitted with an automatic valve, which opens to supply the air chamber, and is closed by the pressure of air when the piston returns. G is a tube leading to and from the air chamber; and H is a continuation of it to the inlet-pipe I, opened and closed automatically by a valve. J is the part of the cylinder beyond the stroke of the piston, and serving as a chamber in which the gas and air are mixed and compressed before explosion; being fitted with the ordinary inlet-port for the admission of gas and air, and an exhaust-port for the discharge of the burned gases.

This description and the illustrations refer particularly to the use of the invention on engines made on the principle of one impulse to two revolutions; and the action of such engines with the annular air-pump is as follows: On the first outstroke of the piston, the cylinder is charged with gas and air; and the chamber E is, at the same time, filled with atmospheric air through the inlet F G. The instroke compresses the gas and air in the cylinder into the space J; and at the same time the piston D forces the air back through the tube G H—the valve closing with the pressure. The air is thus passed on through the valve and tube I, to the space J, where it is mixed and compressed with the combustible mixture already in the cylinder, forming a more highly compressed and explosive compound, which will exert an increased force on the outward passage of the piston. The charge being ignited (by any known contrivance), the valve is closed; and the second outstroke, which impels the piston, again fills the air chamber E. The back stroke drives the air through the tubes G H I, into the cylinder; partially mixing it with the burned gases as they are driven through the exhaust-ports (which are opened and closed by cams from the secondary shaft). By the greater volume and force of the air, nearly all the noxious smoke or vapour is expelled, and its place occupied by air which is comparatively pure—ready to be mixed with the next supply of gas and air drawn into the cylinder. This cycle of operations is repeated at each alternate revolution of the principal shaft; and by this means the back part of the cylinder is cleansed of the burned gas, and a nearly pure air substituted therefor, while an additional volume of air is mixed with the charge of air and gas as it is compressed before ignition, producing, it is claimed, considerable increase of power.

The automatic valves in the tubes may be replaced by ordinary valves, actuated by cams and gearing from the secondary shaft, if required; and in case the quantity of air supplied by the air chamber to the end of the cylinder is too great for the purpose of an effective explosion, a pipe may be connected from the gas-valve to the inlet-tube F, which, under the control of the governor, will at each alternate passage of air to the chamber, open the valve and allow a prescribed quantity of gas to mix therewith. Also, instead of the back plate being made straight, as in figs. 3 and 4, it may be concave, as in fig. 1.

Production of Illuminating Gas.—Smith, J., of Sunbury-on-Thames. No. 14,545; July 28, 1893.

The object of this invention is to provide means for enriching coal gas by oil gas "so that a poor coal can be used in the manufacture of illuminating gas;" and it "consists essentially in the construction of a retort for converting the oil into a permanent gas, and in the arrangement of the retort either alone or in combination with the usual coal-gas retorts."

The oil retort is a cast-iron retort, provided with longitudinal divisions extending from one end of it to near the other end, so as to divide it into two or more chambers communicating with one another, so as to form a continuous channel. The mouth end of the last chamber is connected to the hydraulic main; and that of the first chamber, to the supply of oil. The oil retort is arranged alone or in the stack over the coal retorts; in the latter case, no separate means being required for heating it. The oil is injected by superheated steam into the first chamber of the retort at the mouthpiece; and passing to the back, it enters the second chamber beyond the end of the partition; and so on. In the last chamber, it travels to the mouthpiece, and up the ascension-pipe to the hydraulic main. In this way, "the oil vapours and gases are made to travel the entire length of the retort twice or more, and escape by the ascension-pipe in the last chamber only as permanent fixed gas." The patentee claims that the retort "can be worked at a much higher temperature than ordinary cast-iron gas-retorts, as the partition down the centre greatly strengthens the whole retort, and helps to prevent warping and falling in at the top."

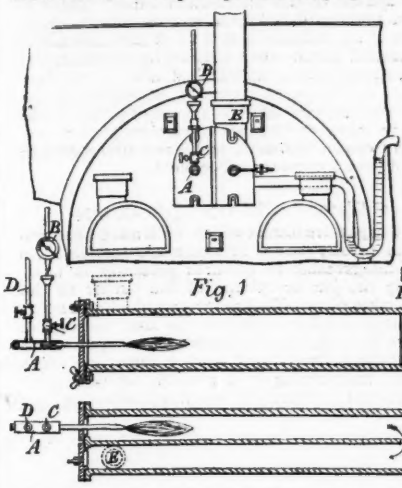


Fig. 1.

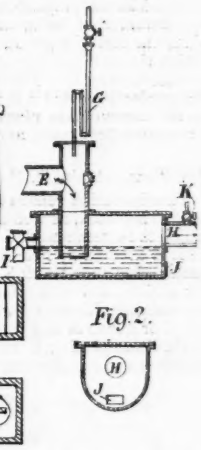


Fig. 2.

Fig. 1 is a front elevation of an oil retort arranged over two coal-gas retorts; also a horizontal section of the oil retort and its connections, and a longitudinal vertical section of same. Fig. 2 is a longitudinal and cross section of the hydraulic main employed.

The oil-gas retort consists of a cast-iron retort, provided with a central longitudinal partition extending from the front end to near the back end of the retort, so as to form two chambers communicating at their back ends. The mouth end of the top chamber is fitted with an injector A, supplied with oil from a suitable reservoir, through a graduated cock B, to a funnel, and passing thence and through the regulating cock C to the injector. The injector is supplied with superheated steam through the cock D. By suitably regulating the cocks B C, a small percentage of air can be admitted with the oil into the retort. The oil injected into the cool end of the top chamber as spray is converted into vapour, which passes to the back or hottest end, whence it passes into the lower chamber, and out by the ascension-pipe E at the mouth end of the lower chamber. The front end of the chamber is fitted with a cock F, to enable the colour of the oil gas to be observed, so as to properly regulate the oil supply. It should be of a dark brown colour.

The patentee mentions that] the gas manufactured in the oil-gas retort carries with it a large amount of tarry matter into the hydraulic main; and the condensers and washers are thus liable to become clogged. Consequently, in order to cool the gas, and condense the tarry matter as soon as possible, he finds it necessary in practice to admit a stream of cold water with the gas to the hydraulic main.

The oil is led by the ascension-pipe E to the hydraulic main, which is rather larger than that usually employed for coal gas. The dip-pipe is extended upwards; and a stream of water is admitted to the top of it by a sealed pipe G. This stream of water meets the hot oil gas from the retort; flows with it into the main; helps to condense it; and arrests the tarry matter. The gas passes out of the main by the pipe H. The excess water and tar passes out by the overflow I leading to the tar well. The main can be cleaned through the opening J. The outlet from the hydraulic main is fitted with a cock K, for observing the quality of the oil gas.

Protecting Lead Water-Pipes from Contamination.—Dougall, A., of Southport. No. 14,586; July 29, 1893.

The patentee proposes to protect water and potable liquids from contact with the lead of supply-pipes by coating their interior surfaces with a preparation insoluble therein, and not liable to chemical change in contact therewith. The materials used are a preparation of cotton-seed pitch, dissolved in bisulphide of carbon, mixed with about an equal quantity of caoutchouc dissolved in naphtha or other volatile solvents. These liquid solutions, when mixed in about the above proportions, and coated on lead surfaces, quickly solidify (on exposure), and leave the lead with a covering insoluble in water or other liquids, and not liable to a chemical change in contact therewith. The manner in which the pipes are coated is to fill them with a solution prepared as above, and after a short interval to drain off the excess, when a sufficient portion adheres to the metal to form a covering which protects it from contact with the water.

Valve-Gear for Cylinder-and-Piston Water-Meters. — Muirhead, W. M., of Glasgow. No. 866; Jan. 15, 1894.

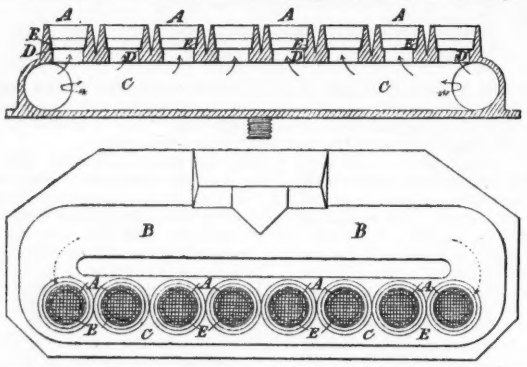
This invention relates more particularly to such water-meters as have the water distributed alternately to the opposite ends of the cylinder by means of a four-way cock or valve, shifted at the end of each stroke by the action of a tumbler; and the object is to render the shifting of the valve more certain and less liable to hesitation than as hitherto arranged.

The piece by the movement of which the valve is shifted, and which has hitherto been acted on only by the weighted tumbler, is so arranged as to be also acted on directly by the shaft which turns over the weighted tumbler, in such a manner as to start the shifting movement of the valve a little before the tumbler falls over. In consequence of the piece which shifts the valve having thus started to move, the action of the tumbler on it is quicker and more certain, and the shifting movement is less liable to be incomplete. The tumbler-shaft

is turned alternately in opposite directions by means of a pinion fast on it, and acted upon by a rack-toothed bar moved by the cylinder piston. The weighted tumbler is loose on the shaft, and is acted on at the ends of the piston strokes by an arm fixed on the shaft. The tumbler, when it falls over, acts on a piece which is loose on the shaft, and which is made with a bevel-toothed segment gearing with a bevel-toothed segment on the spindle of the distribution valve. There is also additionally fixed on the tumbler shaft a boss, made with a projection like the projection of an ordinary clutch; and this clutch-like projection, after being carried round some distance by the shaft, and when the end of a piston stroke is being approached, acts on the piece which the tumbler acts on, and starts its movement a little before the tumbler strikes it. The piece may be acted on directly by the clutch-like projection; but it is in many cases more convenient for it to act on an intermediate piece loose on the shaft, and which first moves to a certain extent itself, and then acts on the other piece.

Gas-Fires.—Main, R. B., of Glasgow. No. 1171; Jan. 19, 1894.

This invention relates to a gas-fire burner which "will altogether prevent firing back, as well as greatly reduce or lessen the hissing noise which is so common and disagreeable in gas-fires presently in use." This is effected by making the jets or nozzles of the burner at the outlet where combustion takes place of bell shape, or widening towards the outlets, and with a flange or other support at the lower ends (or at any suitable distance from the top), on which rests a sheet of perforated metal or gauze of any suitable material, and having turned-up edges to facilitate placing it and maintaining it in position, as well as to enable it to be easily removed for cleaning or renewal if necessary.



In the illustration, A are the jets or nozzles of the burner, the outlets of which (where combustion takes place) are wider than the inlets. B is the mixing pipe or chamber; and C is the pipe which conveys the mixed gas and air to the nozzles. D are the flanges to support the gauzes E, which are so shaped that, when placed into the nozzles, the turned-up edges press against the sides, so as to form a tight-joint and secure them firmly in position. The cold current of gas and air passing continuously through E at a distance from the point of ignition, prevents the gauze becoming overheated, and so wasting away, by direct contact with the flame of the fire; and it also prevents the flame striking back and burning at the injector.

The patentee claims as his invention: (1) In gas-fire burners, having the nozzles or jets of bell-shape, or widening towards their outlets, to facilitate the placing, fixing, or withdrawal of the gauzes or other perforated metal. (2) Providing the nozzles or jets with flanges or other supports at a suitable distance from the point of ignition, to support the gauzes or other perforated metal. (3) Having gauzes or other perforated metal with turned-up edges so shaped that, when placed in the nozzles or jets, the turned-up edges press against the sides of the nozzles or jets, forming a tight joint, to secure them firmly when pressed into position, and also to facilitate the removal of the gauzes for cleaning or renewal, if necessary. (4) The fixing or inserting of gauzes or other perforated material in nozzles, removed from the point of combustion.

APPLICATIONS FOR LETTERS PATENT.

14,087.—Allpass, J., "Securing gas globes and lamp globes or chimneys." July 23.

14,111.—Berlin, N., jun., "Dust protector for incandescent gas-lamps." July 23.

14,122.—Tourtel, J., "Prepayment gas-meters." July 23.

14,131.—Owen, E. T., "Gas or oil motors." July 23.

14,158.—Leathers, C. C., "Water-motors." July 23.

14,234.—Dessy, A., "Lamps for lighting public places, stations, lighthouses, and the like." July 24.

14,294.—Whittall, A., "Controlling the consumption of gas in railway trains." July 25.

14,301.—Byrne, J. S., and Steele, J. T., "Lamps or lanterns." July 25.

14,305.—Harper, J., and Co., Ltd., and Retallack, C., "Frames or cases for oil and gas heaters." July 25.

14,337.—Timpe, A., "Lamps and lanterns." July 26.

14,358.—Saunders, C. J., "Refractory fuel for gas fires and stoves." July 26.

14,385.—M'Mullen, J. A., "Gas-engines." July 26.

14,425.—Roberts, C. R., "Gas or oil engine." July 27.

14,436.—Westphal, C., "Incombustible burners for liquid and gaseous fuel." July 27.

14,476.—Bryant, C. H., "Vapour or gas motor engine." July 27.

14,487.—Clerk, D., "Gas and like engines." July 27.

14,553.—Teissier, N., and Negre, G. L. A., "Retorts of refractory material." July 28.

14,712.—Underwood, G. F., "An improved apparatus which, in combination with gas-meters, enables vendors of gas to sell, and consumers to purchase, gas by the prepayment of penny coins." Aug. 1.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

High-Grade v. Low-Grade Gas.

Sir,—If Mr. Newbigging will again kindly look over my address, he will find that I referred to the paper by Mr. Glover, of St. Helens, read at the last meeting of the Incorporated Institution of Gas Engineers, and to the report by Mr. Dibdin to the London County Council, both of which furnish complete reasons for not making any reference to the reduction of the standard of the illuminating power at Glasgow, and for particularly referring to the proposed reduction "South of the Tweed." Both of these gentlemen show that to reduce 25-candle gas to 20-candle, as was the case in Glasgow (23-candle gas is at present supplied), was a very different thing from reducing a 20 or a 19 candle gas to 14 candles. In the former case, the relative illuminating power obtained from the different qualities of gas when consumed in flat-flame burners bore a relation to the illuminating power; while in the latter, such was not the case—there was a very great loss in illuminating power when the lower-grade gas was consumed in flat-flame burners. These gentlemen also prove that the cost of enrichment is very much less for these lower grades of gas than its value to the consumer.

The Glasgow standard was reduced not because they observed any difference between the illuminating power and the illuminating effect—Mr. Newbigging's pet theory—but simply because the cost to produce the 25-candle gas was considered at the time (years ago) greater than its worth to the consumer. In future, Mr. Newbigging should not endeavour to support his retrograde notion by referring to Glasgow, because the quality of gas supplied in that city is not "low grade."

Notwithstanding all Mr. Newbigging's "waste of words," the cost of enrichment by oil is so low, and the price of cannel is also so moderate, that there is now no longer any reason for reducing the standards of illuminating power.

J. M'Gilchrist.

Dumbarton, Aug. 11, 1894.

Retort-Settings at Manchester.

Sir,—Mr. West must have either misunderstood the Manager of the Bradford Road works, or been misinformed, when he says the settings of nine retorts in No. 1 retort-house have not worked so long as those of eight retorts. Out of twenty-eight beds, eight are set with eight retorts and twenty with nine retorts. Of my own personal knowledge, I can say that settings of nines were started in that house before settings of eights (nearly all the latter being at that end of the house which was not worked the first winter). Settings of nines have certainly been working ever since; for that house has not worked with so few as eight beds alight at any time that I know of.

On inquiry, I find that the Manager does intend to set only eight retorts in a bed in future; and he is at the present time resetting *four* beds. If, however, his intention so to do proves that the settings of nine retorts have been "weighed in the balance," I can only say that I do not agree with the weighing! I cannot find any satisfactory reason for the proposed change; and had I any voice or authority in matter, I should insist upon some proof of the advantage to be gained before permitting the change.

The possibility of heating nine retorts in a bed is not a *theoretical* one. At the Rochdale Road works, I am working nines, and getting 8000 feet per mouthpiece; and the same has been done at Bradford Road. So that there must, of necessity, be a proportionate increase in manufacturing capacity.

For many years, I designed all my settings with eight retorts; but that was because I had not depth enough to put in nines. The eight retorts make a good setting, but they occupy as much room in a retort-house as nine—requiring an arch of equal width; and, therefore, I concluded that nine would be preferable.

I shall want much stronger proof to the contrary than that afforded by the action of the Manager of the Bradford Road works, before I abandon the settings of nines, as the experience I have had with them so far has been entirely favourable.

G. E. Stevenson.

Rochdale Road, Manchester, Aug. 10, 1894.

Hirschfeld's Patent.

Sir,—In referring, in my letter which appeared in your Journal of equal date, to the fact that the expert evidence in the recent action was given without fear of contradiction, it was not in any way my intention to reflect upon the gentlemen giving evidence, nor to suggest that they were giving evidence other than strictly in accordance with the truth so far as their knowledge, information, and examination went. I was merely pointing out the fact that there were no persons in Court who were interested, or whose business it was to show that there might be another side to the case; and that no question as to incandescent gas lighting is settled by the result of the petition to remove Mr. Hirschfeld's patent. I should be extremely sorry if any other construction were put upon my letter, as no personal reflection was intended.

A. Alimonda.

69, Lausanne Road, Hornsey, N., Aug. 7, 1894.

Sir,—We have read Mr. Alimonda's letter in your last issue, and would point out that, the very fact that those interested in the Hirschfeld patent were not in a position to contest our application for its revocation, sufficiently justifies the course we took, and the evidence of the experts whom we called in support of our case.

The Hirschfeld patent was, some months ago, presented to the public with a great flourish of trumpets; and a great deal was made of its alleged superiority to the Welsbach patent. We claimed that it was merely an infringement of our patents; and, on these grounds, we demanded its revocation. Neither Hirschfeld nor anyone else contested our claim; and the patent was accordingly revoked.

We fail to see the point of Mr. Alimonda's remarks; for, had the

Hirschfeld patent been good, surely the patentees would have opposed our application for its revocation. If there is another side to the case, it is a pity that the persons most interested did not present it. One question at least has been settled by the decision of Mr. Justice Romer—viz., that Mr. Hirschfeld's patent is worthless.

L. DE FONBLANQUE, Secretary,
Incandescent Gas-Light Company, Ltd.

Palmer Street, Westminster, Aug. 9, 1894.

Increased Storeage at the Lymm Gas-Works.—The telescopic gasholder for the Lymm (Cheshire) Local Board, for which tenders were invited in the JOURNAL for April 17 last, has been erected by Messrs. E. Cockey and Sons, Limited, under the supervision and to the satisfaction of the Board's Engineer and Manager (Mr. W. Severs).

Presentation to Mr. W. Matthews, of Southampton.—On the occasion of the annual trip this year of the staff employed in the Water Department of the Southampton Corporation, the Engineer (Mr. W. Matthews) was presented by the employees with a handsome silver salver, "in token of their appreciation of his great interest and kindness shown towards them during the past ten years."

Gas-Meter Workers and Trade Unionism.—A conference of workmen engaged in the gas-meter making trade has lately been held in Manchester. Representatives attended from London, Manchester, Edinburgh, Dublin, Oldham, Birmingham, and Wolverhampton. Mr. H. Preston (Manchester) was President; and Mr. J. Deans (London), Secretary. A number of subjects bearing on work and wages in the trade were discussed; and it is stated that the outcome of the conference will benefit the workmen in all the towns represented.

Gas Discounts at Darlington.—At a meeting of the Darlington North End Debating Society last Wednesday, a discussion took place on municipal affairs; and the meeting passed unanimously the following resolution: "That this meeting of the Darlington Debating Society condemns as unjust and cruel the system of the Darlington Corporation of allowing a discount of 25 per cent. to gas consumers—in practice meaning that the poor man is charged 25 per cent. interest if he cannot pay in 14 days, which interest is devoted to reducing the cost of gas to the more wealthy consumers. In the opinion of the above Society, such a discount is cruelly excessive; and a system should be substituted whereby the consumer would receive a discount in proportion to the accommodation he requires—such discount to be charged on the rates of interest usual not among money lenders, but in ordinary business transactions."

Local Authorities and the Water Question.—At the meeting of the Leyton Local Board last week, the Chairman announced that he had attended the conference at the offices of the London Council on the subject of the proposed Water Bills. He said the general consensus of opinion was that each local body would prefer to be independent of the Council. The matter was therefore indefinitely deferred; and he did not think they would hear anything more of it. At the meeting of the Wimbledon Local Board, the Chairman reported the result of the conference. He said hardly anybody but the Chairman of the conference seemed to be in favour of so large a scheme as that proposed. Personally, he did not see why Wimbledon should not insist on doing what they were advised to do several years ago. There was an abundant supply of excellent water to be obtained at the foot of the Surrey Hills which could be brought to Wimbledon. He had long been opposed to supplying so large an area from the Thames, the water of which, to his mind, was not at all pure and good.

Sales of Shares.—At the Wrekin Hotel, Wellington, on the 2nd inst., Messrs. Barber and Son sold the following shares: 45 fully-paid £10 shares in the *Wellington Coal and Gaslight Company*, on which 10 per cent., with an occasional bonus of 2½ per cent. on the coal department, has been paid, at £26, £26 5s., and £26 7s. 6d. each; 62 original £5 shares (10 per cent.) in the *Oakengates Gas and Water Company, Limited* at prices ranging from £11 10s. to £11 16s. each; 22 new £5 "A" shares (7 per cent.) in the same Company, at £7 15s., £7 17s. 6d., and £8 each; and 6 fully-paid £5 shares in the *Hadley and Trench Gaslight Company*, returning 5 per cent., at £1 17s. 6d. each——Last Wednesday, Mr. J. Pallister sold 250 shares (£1) in the *Crook Gas Company* at £1 14s. to £1 15s. 6d. each.——On Thursday, Messrs. Boulton and Cooper sold 20 fully-paid £10 shares in the *Malton Gas Company* for £25 10s. each; and two £10 shares on which £6 had been paid, at £16 7s. 6d. each.——At the Pump Room, Tunbridge Wells, Mr. W. Roper recently offered for sale by auction £5000 of 7 per cent. stock of the *Tunbridge Wells Gas Company*. It was disposed of in 45 lots of £100, and 10 lots of £50 each; the former fetching prices ranging from £161 to £165 10s., while the latter were readily purchased at from £81 to £82 per lot. The total amount realized by the sale was £8170 10s.

The Felixstowe Local Board and the Gas and Water Works.—The Felixstowe Local Board had under consideration, at their meeting on the 1st inst., a motion by the Chairman (Mr. C. A. Creasey) for the appointment of a Committee to consider the advisability of steps being taken to acquire the works of the Gas and Water Companies. He reminded the members that he brought forward a similar motion in December, 1890, and they unanimously passed a resolution that it would be advisable for the Board to undertake to supply the district with water. When, however, the proposal came before the Highways and Bridges Committee, it was rejected. He thought he was right in saying it was the intention of the Companies to apply for parliamentary powers; and it was very desirable that the Board should acquire the undertakings before these powers were granted. He pointed out that, if the Companies obtained them, they would be able to open the roads without the authority of the Board. He had written to 50 local boards similarly situated to that at Felixstowe, and had received replies from 40, of whom 16 were owners of the local water supply, and the remaining 24 desired to acquire it. He did not get so many replies in regard to the gas-works. But they were favourable; and the reason he had included the question of the purchase of the gas undertaking was that, when the Board had a loan for sewerage purposes, they might obtain a large loan at a cheaper rate of interest. The motion was carried; and a Committee was appointed.

PARLIAMENTARY INTELLIGENCE.

PROGRESS OF BILLS.

In the House of Lords last week, the Thames Conservancy Bill was read the third time, with the amendments, further amendments made, and passed. In the House of Commons, the Swindon Water Bill was read the third time and passed, with amendments; and the Lords' amendments to the Thames Conservancy Bill were considered and agreed to.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Wednesday, Aug. 8.

(*Before Mr. Justice* VAUGHAN WILLIAMS.)

In re the Barcelona (Besos) Water-Works Company.

The hearing of the petition by the Union Bank of Spain and England for the winding up of this Company (see *ante*, p. 284) was resumed to-day.

Mr. WARRINGTON appeared for the petitioners; Mr. ASHTON CROSS represented the Company.

Mr. ASHTON CROSS asked for a further adjournment. He said the arrangement for the transfer of the Company's undertaking to a French company had not yet been completed; but if the matter were allowed to go over the Long Vacation, there was every prospect that the negotiations would result in the full payment of the debts of the Company. To show that the negotiations were perfectly *bonâ fide*, he was authorized to state that the French Company would immediately pay a substantial deposit on account of the purchase-money; and he would undertake that 40 per cent. of the deposited amount should at once be applied in satisfaction of the petitioners' debt.

Justice VAUGHAN WILLIAMS: I confess I was beginning to think all this negotiation was a sham; but it does seem to have resulted in something definite now.

Mr. WARRINGTON: There is nothing as yet in the shape of a binding bargain.

Justice VAUGHAN WILLIAMS: No; but, in the face of Mr. Ashton Cross's offer, I should not think it right to make a winding-up order. The petition must stand over the Vacation; but, to prevent the matter being thrown over indefinitely, there will be liberty to apply to the Vacation Judge in case of any difficulty or hitch.

Thursday, Aug. 9.

In re the Gas and Light Company of Portugal, Limited.

This was a petition by the Voluntary Liquidator asking the Court to sanction a scheme of arrangement whereby a sale of the Company's property could be carried out, and the purchase-money and other assets, if any, be distributed. The Company was registered on Feb. 16, 1886, under the Companies' Act, with a nominal capital of £100,000, divided into 20,000 shares of £5 each; and it was formed for the purpose of adopting and carrying into effect an agreement for the purchase of a concession to supply gas to the town of Villa Fara. It was stated that there had been 3055 shares issued, and these were fully paid up. In the course of business, the Company had incurred debts and liabilities. It had issued debenture bonds to the amount of £3875; and this amount, with arrears of interest, was now due. The business had not been a success; in fact, it had been a great failure. Resolutions had been passed for a voluntary liquidation, and appointing Mr. Statham as Liquidator. Various negotiations for the disposal of the business had been entered upon; and last year Mr. Justice Chitty sanctioned a scheme providing for the sale of the whole undertaking to a firm of gas engineers for the sum of £1100. They, however, had the option of withdrawing from the arrangement unless it was completed at a certain date. Difficulties in the way of completion were raised by the local authorities of Villa Fara; and the proposal for sale fell through. It had since been arranged that, subject to the sanction of the Court, the undertaking should be sold to a native Portuguese gentleman for £1100; that the Liquidator should, out of this sum, pay certain moneys owing, and the costs and expenses, when taxed or agreed, of the winding up, and then distribute the residue equally among all the creditors.

His LORDSHIP said that the costs of the Liquidator must be "taxed," not "agreed;" and there must be evidence produced in Chambers that one of the amounts claimed was really due. Subject to these conditions, he sanctioned the scheme.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Wednesday, Aug. 8.

(*Before the* LORD CHIEF JUSTICE *and a Special Jury.*)

Braun v. Smith—Gas Consumers' Liabilities for Injuries Caused by Explosions.

This was an action brought by an artist against a publican, to recover damages for personal injuries sustained by him through a gas explosion on the latter's premises at Denmark Hill, as recorded in the JOURNAL for Jan. 2 last (p. 33).

Mr. MURPHY, Q.C., and Mr. G. A. BONNER appeared for the plaintiff; Mr. WILLIS, Q.C., and Mr. CHESTER JONES represented the defendant.

Mr. MURPHY, in opening the case, said that on Dec. 23 last the plaintiff—who was an artist employed in illustrating newspapers and magazines—called at the Fox-under-the-Hill public-house, at Denmark Hill, and after some conversation with the defendant, who was the landlord, went into the bar. The defendant called to his potman to light the gas in the saloon bar; and immediately there was a loud

explosion which seriously injured the plaintiff—his eyes, ears, and hands being burnt. The result was that he was nearly a month in the hospital, and was unable to do any work for three months. Counsel admitted that a publican was not an "insurer;" but he owed a duty to his customers to take reasonable care in the management of his house. The gaselier in the bar in question had a hydraulic seal; and the cup should have been kept filled with water. No defects having been discovered in any of the gas-fittings after the explosion, it was clear that the escape of gas could only have arisen from want of water; and, under these circumstances, the plaintiff claimed damages.

Mr. *W. F. Braun* was called, and gave details of the explosion. He said his right ear, eye, and hand were permanently injured, so that he was unable to do his work as well as formerly. In cross-examination, he stated that during the six months prior to the accident his earnings were about £10 10s. a week; but that since he had had to give up an appointment because he could no longer work at night or under pressure. He had not earned more than £6 a week since the accident.

Mr. *Wallace*, the House Surgeon at St. Thomas's Hospital, and Mr. *Hayward*, a surgeon of Dulwich, gave evidence as to the plaintiff's injuries. They said the scars and contraction of the eye and finger were permanent; but they had not noticed any injury to the sight.

Mr. *H. A. Rolls*, who was in the public-house at the time of the explosion, said that, immediately after the accident, he saw flames issuing from the cup of the gaselier. The defendant told him afterwards that the gasman had said all the fittings were sound, and that the only fault was want of water in the cup.

Mr. *W. Briggs*, said he had examined the defendant's gaselier, and was of opinion that it should be filled with water weekly. The bar was small; and the water would therefore evaporate very quickly.

At the close of the plaintiff's case,

Mr. WILLIS expressed a doubt as to there being anything for him to answer.

The LORD CHIEF JUSTICE, however, intimated that, in his opinion, a substantial answer was needed.

Mr. WILLIS then opened the defendant's case, and discounted the effects of scars on a man's face; commenting upon the fact that no medical evidence had been called as to injury to the plaintiff's sight. He submitted that, in employing a gas-fitter regularly to attend to the fittings, defendant had done all that, under the circumstances, could be expected of him.

Mr. *C. J. Smith*, the defendant, said he employed a gas-fitter named Chubb to keep his gas-fittings in proper order. The last time he came to the house before the accident was on Nov. 23. He could not suggest any cause for the explosion, unless the gas came from the gaselier, as the fittings were quite perfect.

The potman who lighted the gas gave similar evidence; and denied that water was poured into the cup after the accident.

Mr. *W. Chubb*, a gas-fitter at Dulwich, said that he was regularly employed by the defendant to see to his gas-fittings. He tested them every three months. He called about a month before the accident, and filled the cup of the gaselier in question with water. He could suggest no cause for an escape of gas. If the water were low, gas could, no doubt, escape from the cup.

Two other witnesses, who were called in after the explosion, said the gaselier cup was full of water; and they could not suggest any cause for the accident.

Mr. WILLIS, in addressing the jury, said the onus was upon plaintiff of satisfying them as to the cause of the accident; and this he had failed to do. The defendant had done all that could be reasonably expected of a man.

Mr. MURPHY, in reply, complained that it had been unfairly suggested that plaintiff was not seriously injured, and had not lost work through the accident. As to the explosion, in the absence of any "suggested cause" by the defendant, it was clear that the want of water was a "probable cause;" and he contended that plaintiff was fully entitled to recover.

The LORD CHIEF JUSTICE, in summing up, said the accident was a most mysterious one; for, if the defendant's evidence was true, it went far to show that such an accident as had occurred could never have happened. While the onus, no doubt, was on the plaintiff to show negligence on the defendant's part, he could do so by proving the existence of a state of things which the jury might think could not have arisen if the defendant had exercised reasonable and proper care.

Having retired for a quarter of an hour, the jury returned a verdict for the plaintiff—damages £170.

At the suggestion of Mr. Willis, further questions were put to the jury by his Lordship, in answer to which they said they found that the accident was caused by the gaselier not being "kept filled" with water by the defendant. They were of opinion that the water had evaporated, owing to the smallness of the bar, since Chubb filled it in November; and they thought the defendant should have known that water was wanted in the gaselier.

Judgment accordingly.

Carlisle Corporation Gas Department.—The accounts of the Carlisle Corporation Gas Department for the year ending June 30 last show that the profit realized exceeded £7000, as compared with £3764 in the year 1892-3.

Reduction in Price.—At the last meeting of the Sowerby Bridge Local Board, it was agreed that the price of gas, which was advanced during the coal strike last year by 3d. per 1000 feet, should be reduced to the former charge of 2s. 6d. for the town and 3s. 4d. for the outdistricts.

The Bradford Corporation and the Oil-Gas Processes.—At the quarterly meeting of the Bradford Town Council to-day, the Gas and Electricity Supply Committee will recommend the acceptance of offers of Messrs. R. and J. Dempster, Limited, to fix apparatus and fittings at the Valley Road Gas-Works for manufacturing oil gas by the Peebles process, and of the Northern Counties Hydro-Oxygen Gas Company, Limited, to fix apparatus and fittings at the Birkshall Gas-Works for manufacturing hydro-oxy oil-gas by the Tatham process in conjunction with Brin's oxygen process.

MISCELLANEOUS NEWS.

METROPOLIS GAS SUPPLY.

Deputation to the Board of Trade on the Price of Gas.

Last Thursday, a deputation, consisting of representatives of all the North London Vestries, the Holborn District Board of Works, and the Gas Consumers' Protection League, waited upon Mr. Bryce, President of the Board of Trade, to ask for an inquiry into the Metropolitan Gas Supply. Accompanying Mr. Bryce were Mr. T. Burt, M.P., Mr. J. W. Crombie, M.P., Sir Courtenay Boyle, K.C.B., Mr. F. J. S. Hopwood, C.M.G., and Mr. Garnham Roper; and with the deputation were the following Members of Parliament: Sir A. Rollit, and Messrs. James Rowlands, F. C. Frye, G. Howell, D. Naoroji, E. H. Pickersgill, A. Grove, J. A. M. Macdonald, Keir Hardie, and J. Stuart.

Mr. ROWLANDS said it was his pleasure to introduce two large deputations, representing a very wide and varied interest in London. The first was composed of representatives of the Vestries of the North of London, which, under the Metropolis Local Management Act and other Acts, were the lighting authorities for the Metropolis; the second consisted of representatives of the Gas Consumers' Protection League, a body which had been in existence a little more than a twelvemonth, and which was formed for the purpose of drawing attention to the existing state of the gas supply of the Metropolis. Among those present were gentlemen representing some of the most important City houses, some of the largest retail houses, the small trading class, and also those who consumed gas for domestic purposes, in which was now included very largely that of cooking. The deputation, which he thought must be admitted was fairly influential in numbers, would, he was afraid, have been unable to get into the room had it not been arranged in the month of August. The number of letters which had been received from City firms and from individual traders throughout London, regretting their inability to be present because of their absence from town, was very large indeed. The point they had particularly to urge upon the President was their desire for a parliamentary inquiry into the whole question of the gas supply of the Metropolis. He knew it might be asserted by some that the Board of Trade had not authority to institute such an inquiry; but he felt he was expressing the opinion of the deputation that in saying that, seeing that the whole of the power of the Gas Companies of the Metropolis was derived by statute, the deputation had a right to come to that Department, as representing the Legislature, to ask it to interfere on their behalf, if they believed that the parliamentary power which had been given to the Companies worked inimically to the welfare of the people of the Metropolis. There were virtually three Companies covering London—The Gaslight and Coke Company, the South Metropolitan Gas Company, and the Commercial Gas Company; but there was another Company, the Brentford, which covered a small portion of the County Council area.

Mr. BRYCE asked whether it was desired that the parliamentary inquiry should extend to all the Companies.

Mr. ROWLANDS replied that they asked for the inquiry into the whole of the Companies. He did not think they could have a parliamentary inquiry into one.

Mr. BRYCE: Including Brentford?

Mr. ROWLANDS: Including Brentford, so far as it affects London.

Mr. BRYCE: Of course, if you take the Metropolitan Police district, you will take in a number of other Companies.

Mr. ROWLANDS said they did not want to go outside the County Council area. If they took the 15 miles from Charing Cross—the Metropolitan Police area—they got into a very big thing indeed, into which he did not think they would care to enter.

Mr. BRYCE: I understood that was your view.

Mr. ROWLANDS (proceeding) said he wanted particularly to call attention to the size of the Companies which controlled Greater London. He was about to quote from the parliamentary returns as to gas undertakings for 1892. He knew Mr. Burt had laid the paper for 1893 on the table of the House some little time ago; but it had not yet been issued. At the end of 1892, The Gaslight and Coke Company had 1900 miles of mains in London; 218,183 gas consumers; and supplied for public lighting no less than 50,966 lamps. The Commercial Company, which was the smallest of the three Companies, had only 265 miles of main and 21,776 consumers with 5372 public lamps. The South Metropolitan Company had 790 miles of main and 78,589 consumers, with 18,868 public lamps. These figures were very important, as he would presently have to deal with the charges made by the various Companies. They were led to suppose, as a rule, that the bigger the concern the cheaper the cost of production, and the old plea upon which the Government had sanctioned the amalgamations of the Companies had been that these amalgamations, when carried out, would be for the welfare of the community; otherwise these big Companies would not have had the statutory powers they now possessed. If they first went back three years, they would find that from 1890 down to the present time there had been a continual fluctuation in the prices charged by the Companies; and in all instances the Company which had, in the words of Mr. George Livesey—one of the greatest authorities with regard to gas supply—the best district in London, had always charged their consumers the highest price of those three Companies. In 1890, they were getting gas from The Gaslight and Coke Company at 2s. 6d. per 1000 cubic feet on the north of the Thames and 2s. 3d. on the south. By statute they had to supply their own consumers south of the Thames at the same price as the South Metropolitan Company. Whether or not they made it pay, he did not know; but the consumers north of the Thames felt that if the Company did not make their supply south of the Thames pay, they on the north ought not to be called upon to pay an extra price that they might pay their excessive dividends. But in 1891, the price went up. In 1892 it went up to 3s. 1d. and 2s. 6d.—3s. 1d. on the north, and 2s. 6d. on the south side. During the whole of this time the South Metropolitan Company only increased their

price 3d. in 1892—from 2s. 3d. to 2s. 6d. The Commercial—a very small Company indeed—only raised their price first to 2s. 6d. and then to 2s. 9d.; and they set an example to The Gaslight and Coke Company by reducing their charge at the beginning of this year from 2s. 9d. to 2s. 7d. per 1000 cubic feet. The Gaslight and Coke Company, he admitted, had, in the current quarter, taken 1d. off their charge on the north side of the Thames; reducing their price to 3s. 1d. They first had to take off 1d. on the other side of the water because the South Metropolitan Company did so; but it still made a relative difference of 8d. per 1000 cubic feet on each side of the Thames, as previously.

Mr. BRYCE: What are the South Metropolitan Company charging now?

Mr. ROWLANDS said they were selling at 2s. 4d.; and so were The Gaslight and Coke Company on the south of the Thames.

Mr. BRYCE: Of course, they must go together.

Mr. ROWLANDS said that was so; they could not help themselves. The Gaslight and Coke Company intended, he was glad to say, to reduce their price for the next quarter 2d. more per 1000 cubic feet—that would be to 2s. 10d. He might remark that Colonel Makins told them that it was not the result of their agitation. Of course, they accepted his statement; but they had their own opinion with regard to it. What he wished particularly to draw attention to was this—that in the defence, if he might so call it, of The Gaslight and Coke Company, in a Memorandum which the Governor did him the honour of reading for his edification, they set out a large number of figures; and he was charged with not having replied to those figures. They dealt with the capital account. He was not going to attempt to deal with the capital account of The Gaslight and Coke Company. He was not a Director of the Company, but simply represented those who had to pay; and their case was that it was for the Companies to make the defence, and not for them. But in 1890, when there was a rise in the price of gas, the difference between The Gaslight and Coke Company and the Commercial and South Metropolitan Companies was as between The Gaslight and Coke Company only a difference of 3d. per 1000 cubic feet, and between that and the Commercial only a difference of 2d. When they had given them the best reduction they had offered, there would still be a difference between the south and the north side of the Thames, in the area supplied by The Gaslight and Coke Company of 6d. per 1000 cubic feet. Now, the importance of this to the people of the Metropolis was very great indeed. To quote the figures of the Governor of The Gaslight and Coke Company, a rise or a fall of 1d. per 1000 cubic feet in the price of gas in that Company alone meant a difference of £80,000 per annum, which the Governor divided as follows: £65,000 for the consumers, and £15,000 for the shareholders. Now, if this was the fact (he did not dispute it for one moment, and believed the statement was thoroughly accurate), already the 3d. reduction meant a very vast improvement in the condition of the persons north of the Thames. There were no figures, so far as he could ascertain, to show how much gas they had to supply south of the Thames at the lower rate, and what was the quantity consumed by the public authorities, which they also sold at a low rate. For this he took off £15,000 out of the £65,000—he might be thoroughly inaccurate, but he was obliged to give them some little margin. The 6d. still remaining between the price north and south of the Thames, when they had their lowest price, would mean a difference of £300,000 a year to the people north of the Thames, which had to come out of the trade and the industry and the earnings of those people. The President would realize the vast importance of these figures when he remembered that, in another place, when a Government had a million deficit for the whole of the country, they considered it a very difficult thing to have to grapple with. He (Mr. Rowlands) would get towards the conclusion of his remarks by stating that, at the meeting the previous week of The Gaslight and Coke Company, Colonel Makins (he did not know whether he was foreshadowing that deputation) seemed to feel, or he asserted, that there was no power in the Board of Trade to meet their case. To use his own words, he said: "There was, however, another little difficulty of which the County Council were not aware—that as far as he (the speaker) could see at the present time, after going through their Acts, there was no power to compel the Company to afford information. Such powers of the Board of Trade were repealed, and power was given to them of a continuous audit, the Company now working under the Act of 1876—the sliding-scale and auction-clause Act." Now, he was not a lawyer, and he did not know whether, in the passing of the Act of 1876, certain public statutes were repealed or not; but if they were, it only showed how careful they should be at Westminster in allowing Private Acts of Parliament to be passed which interfered with the Public Statutes of the realm. He had taken the trouble to go through the Acts, and he found that the principal Public Act was that of the 23 and 24 Vict., cap. 125. That was the Act of 1860, which governed all Gas Companies in the Metropolis—the Metropolis Gas Act. He was quoting this to show what he thought was the intention of the Legislature—that the people of London, when a statute was passed giving the monopoly to a company, should not be handed over to that company without any power whatever of dealing with it if it attempted to enforce its charges in an illegal manner or in an exorbitant manner on the people of the Metropolis. Section 7 of the Act of 1860 stated that a Secretary of State had power to appoint an inspector, on complaint of the quantity or quality of the gas by "the Metropolitan Board of Works"—which, of course, would be the County Council now—"or any Vestry or District Board of Works," or "not less than 20 inhabitant householders paying rates for, and supplied with gas." Section 40 of the same Act gave the right of appeal by consumers to the Home Secretary on a rise in the price of gas; and section 45 stated that the Secretary of State might direct proceedings by the Attorney-General against the company. He might be asked why they did not go to the Home Office. Because he thought, as the President was well aware, that all the later Acts gave the powers to the Board of Trade, and not to the Home Office. Now, the principal Act under which the greatest of the three Companies worked was the Act of 1876; and this gave very great powers to the Board of Trade. Section 7 of that Act explained the appointment of the Gas Referees and their power; section 38, the appointment of Gas Examiners; section 39 ran: "There shall be a Chief Gas Examiner, being a competent and impartial person, from time to time appointed by, and removable by, the Board of Trade;" and section 40 explained the powers of that officer, which were very stringent.

Mr. BRYCE asked Mr. Rowlands if he suggested that parts of those provisions were still in force.

Mr. ROWLANDS said undoubtedly they were. He did not think anyone would dispute this with regard to the Act of 1876, from which he was now quoting.

Mr. BRYCE said he was speaking generally of all the provisions to which Mr. Rowlands had been referring. He merely wished to ask whether Mr. Rowlands could distinguish the provisions which he said were still in force from those which had been subsequently repealed.

Mr. ROWLANDS said he thought he had done so. He was not aware that the Metropolis Gas Act of 1860 had been repealed—he was not sure. The Act of 1876 certainly had not been repealed. Section 57 of the Act of 1876 stated: "There shall be an Auditor of the accounts of the Company, being a competent and impartial person, from time to time appointed by, and removable by, the Board of Trade, which Auditor in this Act is referred to as the Auditor." Section 58 gave the Auditor power to ascertain the capital; section 59 gave him power to prescribe the form of accounts to be kept by the Company; and section 60 gave extensive powers to the Auditor before the dividend could be paid.

Mr. BRYCE: That is the Act under which we now audit?

Mr. ROWLANDS replied that this was so; and he quoted it to show the way in which the Board of Trade was brought in with regard to controlling the Companies.

Mr. BRYCE said he thought Mr. Rowlands was going to address himself to the point of Colonel Makins's suggestion that the Board of Trade had no power to hold an inquiry. This was the particular point. They all knew about the audit, as it went on every year.

Mr. ROWLANDS said that, as to the Act of 1860, if there was not this power, the Department would be advised of it by the Law Officers of the Crown. Not being a lawyer, he had not any distinct views on the point, and did not think he ought to have any, when there were a series of Acts, one passing over the other. This was their position with regard to inquiry. He did not know that Colonel Makins would be against an inquiry. At the beginning of the present year, at his half-yearly meeting, he said after reading the Memorandum to which he (Mr. Rowlands) had referred: "Probably this explanation will not satisfy Mr. Rowlands, who will still want his parliamentary inquiry. He is quite welcome to it, as I have already said. We are confident, after carefully going into the figures, that what I have stated is the explanation of the difference in the two prices." So he (Mr. Rowlands) did not suppose Colonel Makins would oppose an inquiry. They felt that there was need of some alteration in the present powers of the Gas Companies in the Metropolis; and if there was no power for inquiry, of course they would regret it. But the thing was what steps they should then take to try and obtain powers for an inquiry. The Companies were at the present time governed by statutes which he thought anyone would admit could not now be passed through the House of Commons. No House of Commons would at the present time give statutory powers to a gas company on a 10 per cent. dividend, fixing, as in the case of The Gaslight and Coke Company, a standard of 3s. 9d. per 1000 cubic feet to start their 10 per cent. upon, with the sliding-scale; and in the case of the South Metropolitan Company a standard of 3s. 6d. per 1000 cubic feet with the sliding-scale. He thought this was a rate of interest which was out of all keeping with modern ideas of investment, and one which he had a very strong notion should be altered. To show how they were under the control of the Companies, Colonel Makins made an offer to the other two Companies last week that, if they were willing, The Gaslight and Coke Company were prepared to abolish the charge for meters, which would, he thought, mean a difference—he was quoting from memory—of some £50,000 to the consumers of the latter Company. The other Company, represented by Mr. Livesey, who was present at the meeting, were not prepared to take up the challenge. He said The Gaslight and Coke Company made this offer because they had no right to charge within the boundary of the City of London, which was the fact, by statute He (Mr. Rowlands) read on the previous day the full report of the proceedings, and he found that the retort of the Governor was very instructive. Colonel Makins said it was very well of Mr. Livesey to make that statement. But prior to 1876 the South Metropolitan Company made no charge whatever for meters until they got their last Act of Parliament, and then they were put on a 3s. 6d. standard for the 10 per cent. dividend, as against 3s. 9d. for The Gaslight and Coke Company; and one of the ways in which they revenged themselves against the Legislature was by immediately resorting to charges for meters, so as to get part of their capital money—to make money, he should say, for their interest.

Mr. BRYCE: You say they did not charge for meters before.

Mr. ROWLANDS: I understand that from the report of their own statements.

Mr. BRYCE: That is a very interesting point.

Mr. ROWLANDS: Yes. Colonel Makins made this statement: "If you, the South Metropolitan Company, agree to abolish meter-rents, we are prepared to abolish them, at a loss of £50,000." "Oh," said Mr. Livesey, "you are the fox who has lost his tail"—meaning, of course, that there was no statutory power to charge it in the City of London, but only in their area outside the City. Then Colonel Makins retorted upon him: "Yes; but you yourselves did not charge it until a given date." Mr. Livesey said: "That was because you got 3s. 9d. as your standard to commence the 10 per cent. sliding-scale upon. We only got a 3s. 6d. standard; and we resorted to the meter charge on purpose to recoup ourselves for that difference, as far as we could, between you and us." Now, they felt that this question had entered into a very acute phase indeed. Colonel Makins, at the meeting of his Company last week, speaking to Mr. Livesey after they had had what seemed to him a rather lively time, said: "Now, Mr, Livesey, let bygones be bygones. Let us shake hands; and let us combine together to fight the common enemy." (Laughter).

Mr. BRYCE: Meaning yourselves.

Mr. ROWLANDS: We are the "common enemy." We are not the clients of these Companies; we are the common enemies. We are fully prepared to take that particular appellation, if it suits the Gas Companies; and we have entered into the arena fully prepared to meet them.

Mr. BRYCE: You are the David fighting against two Goliaths. (Laughter.)

Mr. ROWLANDS thanked the President for the reference. He felt somewhat flattered; but he did not think he should be of much use, even as a David, if he had not a very good sling to use, as represented by the deputation. It was rather amusing to be referred to in that way as the "common enemy," because during the past half year they had supplied The Gaslight and Coke Company with a net profit of £516,643. They were the "common enemy" that had allowed the Company, by their consumption of gas, to pay a 12 per cent. dividend, and to carry over £239,971 to their reserve fund. They thought they had a good case on which to appeal to the President of the Board of Trade; and they hoped he would, as they knew he would, give it consideration. They also hoped there were no legal difficulties in the way of a Select Committee of the House of Commons inquiring into the question; and they would be pleased if the President could grant their request.

Sir ALBERT ROLLIT said that he supported the views expressed by Mr. Rowlands, and concurred both in that gentleman's statement of the circumstances and in the reasoning by which it had been supported. His (Sir A. Rollit's) office was simply to state what he believed to be the feeling generally in North London. He said, as a member for one of the North London constituencies, that very large numbers of those he represented held upon this subject the very strongest opinion. This matter was an all-important one to the public authorities, to men of business, and to tradesmen—and especially, probably, to the smaller tradesmen, who had many difficulties to contend with, and upon whom no burden which was unjustifiable either by statute or economically, ought, if possible, to be placed. Any such burden they must do their best to remove. What he thought was the most unfair aspect of the question, and the one which perhaps excited most feeling, was the differential treatment as between north and south. This was distinctly a burden upon those who carried on business in North London, as against those who carried on business in the south; and it seemed monstrous that merely the river should divide and make a distinction so entirely to the prejudice of those who happened to live on the north side. It was not merely the individual, but the public authorities also, who had great cause of complaint. The Local Authorities—including, he believed, his own Vestry of Islington—had repeatedly drawn attention to the subject. One of the striking features of the position was that the Company could afford to supply the public authorities (though they believed even there at an excessive rate) upon much more advantageous terms than they dealt with the general body of the public; showing that there must be some margin which would admit of a reduction. Upon this question he would give a practical illustration, which he thought was a striking one, as between North and South London. If he was correctly informed, taking the case of the School Board consumption alone in North and South London, he believed the additional tax upon the School Board in the North of London, in reference to the consumption of gas, amounted to no less than £1100 a year. He did not think they could have any fact which would be more illustrative than this of the gross injustice and inequality between the two sides of the river. There was only one other evidence of local feeling to which he would refer, and that was the meeting which was presided over by himself recently at the Holborn Town Hall, and which was largely attended by all classes of the people. He mentioned this because he had seen in the papers a criticism by Colonel Makins, which, if it were correct, might discount the value of that meeting. But if what Colonel Makins said were incorrect—namely, that only one side of the case was put before the meeting—then obviously that gentleman recognized by that criticism the strength of the evidence of feeling, and he presumed of judgment also, on the part of a large gathering of the people of North London. The observation which was made was that he (Sir A. Rollit), as Chairman of the meeting, was supplied, in detail, with facts and circumstances, but had suppressed them; and he therefore did not contribute to a proper judgment being arrived at. He would assert, in the presence of several Members of Parliament who were at the meeting in question, that not only did he state to the meeting that everyone should have the protection of the Chair in making remarks either upon one side or the other; not only did he invite, more than once, speakers to take the opposite view, but he placed before the meeting the views entertained by Colonel Makins (and he so stated them), and went into some little detail as to the grounds upon which these views were based. At least in one instance, on the question of the canal dues, he said it appeared to him that these views were well founded. So that not only was there no suppression of fact, but there was an indication to the meeting that there was another side of the question which ought not, in fairness, to be lost sight of. He thought that the complaint was his. He did not question his friend Colonel Makins's motives in supplying that information; but he believed that it was intended as a "brief"—so that he might be the *advocatus diaboli*, instead of doing his duty as Chairman, and taking care that if, on the one hand, the *diabolus* was heard, the opposite view was also put before the meeting. He had seen recently an appeal on the part of the Chairman of The Gaslight and Coke Company to his former rival—to one who had been a very strong and experienced critic—to join hands against the "common enemy," who must be the consumer. His friend Mr. Naoroji and he were not important enough to be the "common enemy." The "common enemy" was the consumer, who had to depend upon a large and at times, owing to its power, an oppressive monopoly. The consumer wanted no more than what was fair and just; the consumer desired that there should be a reasonable return on the capital invested for public purposes. But, on the other hand, he demanded that he should have fair and reasonable treatment. If the President of the Board of Trade contributed to that end—looking to the grave importance of lighting, for social and many other reasons—and if he could use his powerful influence so that the consumer should be only fairly treated, he would have done a great public service.

Mr. E. HOWES (the Chairman of the Vestrymen's Conference) desired, on behalf of the Vestries north of the Thames, who had had a conference on this matter, to emphasize one or two views which had already been laid before the President. Their grievance, as had already been stated, was that they were paying from 22½ to 25 per cent. more for the same article than their fellow-traders and competitors on the south side of the Thames did; and as the Company which supplied the gas at the lower price was able to pay dividends of 13¾ per cent., the inhabitants of the north side thought they ought to be placed on the same basis. Sir Albert Rollit had referred to the fact that this matter not only affected them as private consumers, but as public consumers also; and he had stated that it made a difference to the London School Board of £1100. He happened to be a member of a Board of Guardians—not a large Board—and in their case it made a difference of £400 per annum. If they were to multiply this by all the public authorities and boards of guardians north of the Thames, they would see that it was a very important matter even to the ratepayers. The £1100 mentioned for the School Board was not a net sum; for there were the costs of collection to be added. So that altogether the ratepayers on the northern side of the Thames had to pay a very largely increased price for their gas. They had heard that the Gas Company had been "generous" enough, according to their view, to reduce the price of gas for the current quarter by a 1d. per 1000 cubic feet; but he thought it should be at the same time stated that they had increased the price of the gas used for the public lamps by 2d. per 1000 cubic feet. So that their generosity was considerably discounted by the fact that they had given 1d. on the one hand and had taken 2d. on the other. The Vestries had had this matter under their consideration; and the reason they had come to the Board of Trade was because they were on such a different footing compared with the majority of provincial towns. If they were living in a provincial town, this matter would be under the control of the council, and the council would be able to deal with it; and if there was an increased charge for gas, the surplus would undoubtedly go into the pockets of the ratepayers. But in the north of London, they had no control over the Gas Companies; and, therefore, they had to come to the President of the Board of Trade, and invoke his assistance. If there was no power by which he could himself help them, then they asked him to help them in Parliament, to get a parliamentary inquiry into the working of the Gas Companies. He believed it had been stated by Mr. Livesey himself that there had been an extravagant expenditure on capital account with one of the Companies. If so, this was a matter that should be looked into, because the consumers ought not to be burdened with money which had been wasted in capital expenditure. They thought the time had arrived for Parliament to consider the statutory limit of 3s. 9d. per 1000 cubic feet for gas, and the 10 per cent. dividend on the capital. The Government, some few years since, thought fit to reduce the rate of interest upon Consols; but if the Government did so with a security of that kind, with only 3 per cent. dividend, surely the time had arrived when Parliament should also reduce the 10 per cent. dividend to the Gas Companies. They all knew that the 10 per cent. was fixed when money was at a very much higher value than at the present time; and, as Mr. Rowlands had said, if Parliament had now to consider the question of fixing a limit, it would fix a far lower limit than 10 per cent. He himself doubted very much whether it would be above 5 per cent. Another point they ought to have some inquiry into was whether the Companies were justified in building up a reserve fund at the consumers' expense. Out of last half-year's profit, one Company had set aside a considerable sum for reserve. He had noticed that the South Metropolitan Company were building up a reserve at the expense of their shareholders; and, instead of paying, as they could, a dividend of 13¾ per cent., they were going to pay a dividend of 13 per cent., and carry the ¾ per cent. to a reserve fund. With their low charge, the South Metropolitan Company were able to do this. The Gaslight and Coke Company did not, however, treat their customers in the same way; but they built up the reserve fund at the consumers' expense. As Mr. Rowlands had pointed out, in the north they had to pay 3s. at the present time as against 2s. 4d. paid by other customers of The Gaslight and Coke Company on the south of the Thames. If the Company could produce and sell gas at 2s. 4d. at a profit in the south, they ought to sell it in the north at the same price. But if they sold it in the south at a loss, that loss ought not to be borne by the north. He knew they were compelled by Parliament to sell at that price in the south; but that was a matter which Parliament should inquire into, and it should not permit customers of the same Company to be treated to preferences in that way. He assumed, from the remarks which had been made by Colonel Makins, that if they supplied meters free, it would cause a reduction in their revenue of £50,000, which, according to Mr. Rowlands's figures, would mean about 1d. per 1000 cubic feet on the gas. The City of London had the benefit of the penny; and they thought that those who were outside the City and on the northern side of the Thames should also have all those preferences given to them. If this matter involved the Company in loss, then they said it was a matter that should be rectified.

Rev. E. CANNEY said he had been asked to speak on behalf of the Gas Consumers' Protection League. Mr. Rowlands and Mr. Howes had gone over all the ground so entirely that, if he said very much, he should only be repeating what they had said. But he could testify, as Sir Albert Rollit had done for his own neighbourhood of Islington, to the very strong feeling of indignation which existed in Holborn against The Gaslight and Coke Company particularly because of the excessive and unfair charge which they were making to the gas consumers. What had stirred the people of Holborn in particular was the fact that they were paying 8d. per 1000 cubic feet more for their gas than people in business on the other side of the water were paying; and that to the same Company. They believed that the Board of Trade had the power to institute an exhaustive inquiry into this matter; but if the Board could not help them to get this grievance redressed, they thought Parliament would certainly do so. It had been well said that what Parliament had given, Parliament could take away. They therefore came in the first place to ask the Board to

hold an inquiry, in the hope that the result of it would be that the necessary parliamentary action would be taken, so that there might be ultimately a uniform gas rate for the whole of London.

Mr. GEORGE HOWELL, M.P., as representing the extreme West of London, said that the part of London in which he lived had to complain still more than those other portions represented by the previous speakers. They were charged 3s. 3d. per 1000 cubic feet by a Company—the Brentford Company—which did not supply the best of gas. Comparing this with the price charged on the south side of the Thames, this was a burden to be included within the purview of the proposed inquiry. If the Board of Trade had no power of inquiry apart from Parliament, or if the Companies should attempt to resist any power or dispute any power that the Board of Trade might possess, they had still left to them the power of an inquiry by Parliament. He thought he could say that the Metropolitan members on both sides of the House would give their best support to the Government in order to carry a motion in the House for instituting an inquiry; and he ventured to say to the Companies that, if such an inquiry were instituted, it would be a very searching one. He hoped that something would be done in connection with the Board of Trade which might lead to a solution of this difficulty by the Companies meeting the consumers in a fair and honourable manner.

Mr. DADABHAI NAOROJI said that in his constituency of Central Finsbury the feeling on this matter was as strong as in any other part of London. They regarded the higher charge on the north of the Thames as a very great injustice. There were not only shopkeepers in Central Finsbury, but that district was essentially an industrial constituency which needed the use of gas very largely.

Mr. BRYCE, in reply, said he was indebted to the members of the deputation for showing, by attending in such numbers, the interest which they and the local bodies they represented took in this question. He had been well aware that the question had engaged a great deal of attention in London; but the deputation was an additional testimony to the feeling which existed upon the subject. He had received a good many memorials and resolutions passed by Local Authorities; and lately he had received one from the London County Council itself. These all more or less dealt with the question, and called the attention of the Board of Trade to it. But, at the same time, they did not altogether agree in the suggestions which they put forward; nor in the arguments by which the suggestions were supported; nor in the practical request which was made. This was one of the difficulties that he felt in dealing with the case as it had just been presented to him. Although the deputation had represented the grievance with great force, and with sufficient detail, it was not quite clear to him what was the particular kind of inquiry which they and the various memorializing bodies desired. Two different kinds of inquiry were asked for; and the subjects that were sought to be included in these inquiries were very various. The deputation had asked for a parliamentary inquiry; and some of the memorialists had also asked for it. If he rightly understood the request made by the deputation, they did not wish to exclude the Board of Trade inquiry, though most of them contemplated a parliamentary inquiry. On the other hand, the County Council asked for a Board of Trade inquiry, and did not appear to contemplate one by Parliament. The subjects which had been suggested for inquiry were rather different. It had been suggested that they should go into the question of management. It had also been suggested that they should go into the question as to whether the audits were sufficiently comprehensive, or sufficiently probed the accounts. With regard to this he could only say that the Auditor was a gentleman of very great competence and ability; and he (Mr. Bryce) had every reason to think that his audit was a satisfactory one. At any rate, the accounts were presented to Parliament; and it was quite possible for anyone to raise any question as to whether the audit ought to cover other matters, if it was desired so to do. Then it had also been suggested that some wider points should come in—that the question of whether there ought to be an amalgamation and union of all the Companies should come in; and that the question as to a possible ultimate acquisition by a public authority of the Gas Companies' undertakings should come in. He perceived that this was in the minds of some of the deputation. He gathered clearly, from what some members of the deputation had said, that they desired to see Parliament revise the scale of charges; that they desired to see Parliament go back upon its former statutes, and make a new sliding-scale, which would change very much the conditions under which the Companies now made their dividend. In addition to all these proposals (which ranged from something quite small and simple to something very large, and raised wide issues of policy), they had also a suggestion made that there should be an inquiry into certain scientific questions. The County Council evidently contemplated a scientific inquiry as to what should be the rules as to testing the illuminating power, and the use of portable photometers, and so on. The deputation had not, he thought, dwelt upon this aspect of the question; but at the same time he could not exclude it from consideration. These matters surrounded the subject with difficulty. Before he could give any distinct answer as to what kind of inquiry the Board of Trade would contemplate, he should require to know what were the particular points that they desired inquiry into; and he should require to know whether, on the whole, the balance of opinion was in favour of a Board of Trade inquiry or in favour of the bolder and larger step of a parliamentary inquiry. He would certainly require a somewhat more distinct statement of the points which the inquiry was to cover. Suppose, for instance, that he intended to propose a parliamentary inquiry, this would necessitate putting down what were called the terms of reference. Everything as to the reception that would be given to the proposal in Parliament would depend upon the terms of reference. They might be such that Parliament would accept them without opposition. On the other hand, they might be such as would involve long and angry debates. The Members of Parliament present would know how much difference there would be—depending upon the terms of reference—as to the reception which a proposal of this kind would meet with, and as to the time which it would occupy. This would naturally be a matter which the Government of the day would have to consider; questions of time being among the most important questions they had to deal with in considering what they should attempt in any given session. These were matters on which he would like to have from them a somewhat more specific statement than they had been able to give in presenting the general aspect of the case. They were also points on which he would certainly invite the opinion of the London County Council, which, in a certain sense, was entitled to speak for them all. He did not think he could make any very definite statement as to what view he should take, until he had a more clear indication of the kind of inquiry that was wanted. A good deal would, of course, depend upon the view which the Treasury would take. The Treasury would naturally have to be asked, in the case of a Board of Trade inquiry, to make provision for the expense of it; and he would be required to state what the nature of the inquiry would be, how long it would occupy, and what expense it would involve. All this would depend upon the terms of reference. He need not enter into the question of the powers of the Board of Trade, nor into the question of the attitude of the different Companies towards such an inquiry. Mr. Rowlands had intimated that he did not contend that the former power existed now; and at the same time he had suggested that certain language used by the Governor of The Gaslight and Coke Company seemed to indicate that that Company would not necessarily object to a Board of Trade inquiry, and therefore would not make it necessary for the Board of Trade to determine what its statutory powers were. If he (Mr. Bryce) were to propose a parliamentary inquiry, he certainly would have to undertake to deal with some very large questions. The question which suggested itself first of all was whether it was desired to have a unification of the various gas undertakings, and to look upon that unification as a preliminary to handing over the gas supply of London to a public authority. There were, he thought, nine of our great towns in which the gas supply was in the hands of the municipality; and he believed that in most of these towns (although as regards some of them there was some little dispute) the results had been satisfactory. He presumed, therefore, that many of the deputation probably looked upon this as the ultimate goal towards which they would like to move. Of course, that was a very large question; and it was impossible to sever it from the question of what terms should be made with the existing shareholders of the present Gas Companies. One speaker had said that what Parliament had given Parliament might take away; and several had referred to the gentlemen who had invested years ago, and who were now receiving large dividends upon the prices which they had paid for their shares—it might be 18 or 20 years ago. They could not, however, look upon the matter purely from the point of view of the gentlemen who bought when the shares were low; because the purchases of shares had been going on constantly, and, although the dividend might be nominally paid at the rate of 12 per cent., that dividend would be a very much smaller one to the recent investors, who had bought shares at the high prices. He did not think any of them wished that the question of the position of investors, and the question of the general faith of an investment upon a parliamentary security, should be excluded from consideration. Evidently it was an extremely important part of the question; and, although a bad bargain might have been made, still a bargain which was made by statute was a bargain which *primâ facie* was entitled to be respected, and which Parliament could only be asked to reconsider upon very strong evidence indeed, and upon conditions which would prevent any disturbance of the faith which was placed, and rightly placed, upon a parliamentary bargain. This was a question of very great magnitude; and before he could contemplate a parliamentary inquiry which would look towards these large issues, it would be necessary not only that at the Board of Trade very careful consideration should be given to the matter, but that he should consult his colleagues upon it. It was obviously a question which raised such large issues, that no Minister would, without consulting his colleagues, venture to pronounce an opinion upon it. He was free to confess that he thought Parliament did make a bad bargain; and that it was to be regretted that the hands of Parliament and of London were tied in the way in which they were tied by existing statutes. He was happy to say that the Board of Trade had learned by experience in this matter; and he could also say that the Board would have made a better bargain for the people of London in previous years than had been made for them by Parliamentary Committees. The researches which had been made for him into the archives of what had passed then, showed that the Board of Trade would gladly have done more for the people of London in those days than Parliament permitted it to do. When the question of electric lighting came up—as was no doubt known to the deputation—provisions were inserted in the Electric Lighting Provisional Order Bills, under which the interests of the people of London in the future were protected, and provision made for them. It was quite true that great steps forward had been taken since 1876. They had, he thought, much larger views of what was due to the interests of the people than they had in 1876. He was also sure that, if they were entering upon this matter again, they would have the same regard as to the interests of the people as was had when the Electric Lighting Bills were passed; and that they would endeavour to profit by the experience which had been obtained since then by those great towns in which the gas supply was in the hands of the municipality. He could not forbear from expressing the strong feeling which he entertained upon this subject—that those sources of wealth, as far as possible, and consistent with good management (and he thought the experience of those great cities showed that it was consistent with good management), ought to be in the hands of the public authorities, and that what was called the "unearned increment," or the profit which accrued, in that way ought, if possible, to be made available for the benefit of the people, in ways in which it was in those municipalities, and in which, unfortunately, it was not in London. He had never hesitated to express these opinions in Parliament; and there was no reason why he should hesitate to express the same opinions there. These considerations added to the sympathy which he felt for the deputation. Their case was, in many respects, a hard one. On the north of the Thames they were paying more than people were paying on the south of the Thames. There was a difference of 6d. per 1000 cubic feet, which, as Mr. Rowlands had pointed out, meant a very large sum in the year. This was a hardship upon them; and the question was becoming increasingly important by the

additional use which was being made of gas for the purpose of cooking by the humbler classes. While they were adding to their consumption of gas for this purpose, it made the question of price even more essential to them than it was before. He supposed they might say also that the greater zeal and interest the Local Authorities were showing in the question of lighting, which made them desire to provide better lighting in the streets, was also a cause of increase in the expense which they were put to, and therefore in the charge which ultimately fell on the ratepayers. They might rely upon it that the Board of Trade would consider with the utmost sympathy every representation which had been made, and would give very careful attention to the whole subject. More than that he could not say at the moment. He was bound to have regard, on the one hand, to the good faith which they must keep with investors, and to the danger of disturbing a settlement by Parliament, on the faith of which investments had been made; and, on the other hand, to the general interests of the people of London. He could assure them that the Government would endeavour to treat these and all other considerations with the very utmost care, and to bear in mind how great was the interest which the deputation had testified to. It must be a comfort to them that, at any rate, there was a prospect of some reduction and that the reduction in price which had been announced would—even if it was accompanied with an increase in the public charge—be a relief to the humbler consumers of gas. But he did not say that this by any means diminished the duty which the Board of Trade felt incumbent upon them of giving their most careful and anxious attention to a subject of such great importance. (Applause.)

Mr. ROWLANDS, in thanking Mr. Bryce for the kindness he had shown in receiving the deputation, and for the remarks which he had made, hoped that he would give the attention to the subject which he had promised. The deputation would be pleased to supply the Board with any further information that might be required.

Sir ALBERT ROLLIT: I think the suggestion of a parliamentary inquiry is made chiefly because of the doubts as to the statutory powers of the Board of Trade in instituting one on its own account. But, assuming these doubts to be removed, then I think probably all parties would be satisfied with the action of the Board of Trade.

Mr. HOWELL: I may say, Mr. President, that is what led me to make my remarks more particularly with regard to parliamentary action.

Mr. BRYCE said he ought to point out that a Board of Trade inquiry could only go to what might be called the minor aspects of the subject. If they desired legislation, and especially if they desired legislation to be of a searching and important kind, it was quite clear that Parliament would not be satisfied with anything less than a parliamentary inquiry as a preliminary to such legislation. This ought to be borne in mind by the deputation, in case any of them thought fit to raise the question in Parliament, which perhaps they might be advised to do.

The deputation then withdrew.

BROMLEY GAS CONSUMERS' COMPANY.

The Half-Yearly Report and Accounts.

The report of the Directors of the Bromley Gas Consumers' Company, with the accounts for the six months ending June 30 last, have been issued, in view of the half-yearly general meeting on the 22nd inst. The Directors state that the gas-rental continues to increase, though not so largely as in some former years; but they record with satisfaction that the day consumption advances, owing to the gradual extension of the use of cooking-stoves. The revenue from the sale of gas in the half year amounted to £13,169; residuals produced £4732; and the total receipts were £18,441. The manufacture of gas cost £9700, of which £7314 was paid for coal; its distribution entailed an outlay of £233; management came to £1365; and the total expenditure was £12,301—leaving a balance of £6140. The profit and loss account shows a sum of £6024 available for distribution; and the Directors recommend a dividend at the rate of 11½ per cent. per annum on the ordinary 10 per cent. shares, and of 8½ per cent. per annum on the 7 per cent. shares. These will amount to £5510, and leave £514 to be carried forward. The price realized for residuals was favourable as compared with 1893; coke having fetched 10s. 3d. as against 7s. 9d. per chaldron, and sulphate of ammonia having produced a more satisfactory return. With regard to the manufacturing operations, which are under the supervision of Mr. W. Woodward, 9100 tons of coal and 297 tons of cannel were carbonized in the past half year, and 90,257,000 cubic feet of gas made; the residuals being: Coke, 9397 chaldrons; breeze, 987 chaldrons; and tar, 93,927 gallons. The quantity of sulphate produced was 57 tons 10 cwt. The works in connection with the enlargement of the retort-house and the erection of the new arches with regenerative furnaces, and also of the new purifying house and apparatus, commenced last year, have been completed; and the remainder of the arches in the large retort-house are now being replaced on the regenerative system. The Directors have recently entered into a contract for the erection of a small plant for the manufacture of oil gas by the Peebles process; and they express the hope that great advantages will accrue therefrom.

The Electric Lighting of the Thames Embankment.—At the last meeting of the London County Council before the recess, the Chairman of the Highways Committee (Mr. E. Jones) reported that the Council's decision to have side lighting in place of centre-road lighting on the Thames Embankment would mean an addition of more than 25 per cent. to the number of lamps (108 to 136)—necessitating an increase in the estimate. The Committee recommended that the authorized capital expenditure in connection with the electric light installation for the Embankment and gardens, and Waterloo and Westminster Bridges, be increased from £15,000 to £20,000. Mr. Westacott proposed, as an amendment, that the whole matter be deferred until next spring, so that it could be more fully considered. This was agreed to. The increase in the capital outlay will entail an additional £870 annually for maintenance; bringing up the amount to £3880. The cost of gas lighting is less than half this sum.

PROVINCIAL GAS AND WATER COMPANIES.

We continue to-day our notice of the principal features in the reports of Provincial Gas and Water Companies for the past half year.

Gas Companies.

At the half-yearly meeting of the Bristol Gas Company on the 24th inst., the Directors will report a gratifying increase in the sale of gas in the six months ending June 30 last, as compared with the corresponding period of the past year. The quantity of gas sold for public and private lighting brought a return of £102,071; the rental of meters and stoves, £2127; residual products, £27,974—the total receipts being £132,421. The manufacture of gas entailed an expenditure of £76,414 (including £45,445 for coals); its distribution cost £3814; lighting and repairing public lamps, £2177; rents, rates, and taxes came to £3855; and management, to £4799—miscellaneous expenses bringing up the total to £92,314. The balance carried to the profit and loss account is £40,107; and the amount available for distribution, £37,964. The Directors recommend a dividend at the maximum rate of 5 per cent. per annum. After paying this and the interest on debenture stock, and carrying £5000 to the reserve fund, there will remain a balance of £7410, which, with £7382 brought forward, will allow £14,793 to be carried to the credit of the next account. As already announced, the price of gas has been reduced by 2d. per 1000 cubic feet as from the 1st ult. The quantity of coal carbonized in the past half year was 83,575 tons; of cannel, 7014 tons—together, 90,589 tons. The residuals produced were: Ordinary coke, 52,560 tons; cannel coke, 4056 tons; breeze, 8114 tons; tar, 929,655 gallons; ammoniacal liquor, 2,114,942 gallons.

At the meeting of the Dorchester Gas and Coke Company, Limited, to-day, the Directors will report a slight decrease in the consumption of gas in the six months ending June 30 last, as compared with the corresponding period of 1893. The sales, however, amounted to 12,622,000 cubic feet, producing £2402; and the total receipts to £3012. The expenditure being £1999, there was a sum of £1013 to go to the profit and loss account. The balance available for division is £1145; and the Directors recommend the payment of the usual dividends of 10 and 6 per cent.

The Directors of the Poole Gas and Coke Company, Limited, presented a favourable report to the shareholders at their half-yearly meeting yesterday. The revenue from the sale of gas for private lighting amounted, for the six months ending June 30 last, to £2136; the public lamps and those supplied by contract bringing in £249 more. The total receipts were £3128; while the expenditure was £2028—leaving a balance of £1100. The balance this time last year was £1061; the price charged to private consumers for the first three months of the year being 3d. per 1000 cubic feet more than at present. But there has been an increase of a little over 6 per cent. in the sale of gas; showing that the concern is making satisfactory progress. The amount available for distribution was £4002; and the Directors recommended the payment of the maximum dividends, less income-tax. They thought there was every prospect that a considerable increase in the manufacture and distribution of gas would have to be provided for shortly, owing to the large number of building sites being opened out. The Manager (Mr. W. Davis) had reported that, to complete the public lighting alone, more than seven miles of additional mains would be required. This was a matter for serious consideration, as for some time the outlay must of necessity be unproductive of profit. However, with the improvements now being made in the manufacture, and the economy effected by the Manager, there was, they considered, every probability that the dividends would be maintained.

The Directors of the Weymouth Consumers' Gas Company will submit a satisfactory report to the shareholders at their meeting next Thursday; for they state that there was a general increase in the receipts in the six months ending June 30 last. The sale of 24,416,200 cubic feet of gas produced £4862; residuals yielded £1087; and the total receipts were £6253. The expenditure amounted to £4075; so that there was a balance of £2178 to go to the net revenue account at the close of the half year. The sum available for division is £3000; and the Directors will recommend the payment of dividends at the rates of 10 and 7 per cent. per annum, subject to deduction for income-tax.

Water Companies.

At the meeting of the Cambridge Water Company on the 2nd inst., the Directors reported that, after paying dividends at the rates of 10 and 7 per cent. per annum for the six months ending June 30 last, there would, with the addition of the balance brought forward, be a sum of £3943 to be carried to the next account. The Engineer and Manager (Mr. W. W. Gray) reported that, in the above-named period, water had been laid on to 174 premises, the increased rental derivable from which would be £192 per annum. The Chairman (the Rev. Dr. Perowne), in moving the adoption of the reports, expressed his gratification that, while the present position of the Company, so far as could be judged, was highly satisfactory, their prospects were equally good. The reports were adopted.

The revenue account of the Cleveland Water Company shows receipts for the past six months amounting to £3531, which, with £527 balance from the previous half year, makes a total of £4058—an increase of £693 upon the corresponding period of 1893. The expenses came to £1061; leaving a disposable balance of £2996. Dividends are recommended at the rates of £6 15s. per cent. on the original and "A" shares, and £4 14s. 6d. per cent. on the "B" shares (free of income-tax), as against £6 and £4 4s. respectively for the first half of last year. It is also proposed to transfer £125 to the contingent fund, which will raise it to £4025.

At the half-yearly meeting of the Grantham Water Company last Tuesday, the report presented by the Directors for the six months ending June 30 last showed a balance on the revenue account in favour of the Company of £4986. The Directors proposed that £1750 of this sum should be applied in payment of a dividend of 5 per cent. for the past half year, and that the balance of £3236 should be carried forward. The report was adopted.

In their report to be presented to the shareholders at their half-yearly meeting on the 30th inst., the Directors of the South Stafford-

shire Water-Works Company state that the number of services laid on in the six months ending June 30 last was £1838; making the total number of houses supplied 83,332. The gross amount of water-rates was £41,378, as compared with £40,186 in the corresponding period of last year. After providing for interest on debenture and preference stock, the amount remaining for division (including £3084 brought forward) is £19,196; and the Directors recommend the declaration of a dividend on the ordinary stock at the rate of 5¼ per cent. per annum, less income-tax. This will leave a balance of £3345 to the credit of the current half year.

The half-yearly meeting of the Stockport Water Company on the 2nd inst. was of more than usual interest from the fact that the Chairman (Mr. G. H. Hill, M.Inst.C.E.) made an important statement as to the quality of the Company's water, which had been attacked in a report issued by Dr. Porter, the Medical Officer of Health for the borough. The first portion of the business consisted of the presentation of the Directors' report, with the accounts for the half year ending June 30 last. The latter showed a balance of £8169 available for distribution; and the Chairman moved that dividends at the rates of 2½ and 2¼ per cent. on the 5 and 4½ per cent. stock respectively, and of 6¼ per cent. per annum on the ordinary and new ordinary stocks, be declared. Colonel Howard seconded the motion, and it was carried. The Chairman then dealt at some length with Dr. Porter's report; stating that it contained many inaccuracies, of which the Company had good reason to complain. He pointed out that, on the plan accompanying the report, a large stream, which was marked as "receiving sewage effluent," was shown as being within the Company's catchment area, and as flowing into the main leading from one reservoir into the filter-beds, and so supplying the borough; whereas nothing of the kind was the case. The water was really 100 feet higher than the stream at that point. The plan, getting into the hands of an outsider, would, he, said, probably have the effect of doing the Company considerable harm inasmuch as people would believe that water was taken from a polluted stream. He thought these were things Dr. Porter ought to have made himself fully satisfied about before he made his report or published the plan. The Company were doing everything they possibly could—whether or not the Corporation watched them made no difference—to give a good supply of water to Stockport; and they said, without fear of denial, in regard to their supply, that it was excellent, and no fault could be found with it. They had an unpolluted catchment area which was quite as good as the Manchester gathering-grounds, and those of Halifax, Oldham, and other places. It was a different thing when they took water from a large river, where there were towns above the point at which they were obtaining their water. He had been engaged in connection with water supplies for many years; and he must say that he could not see how they could possibly improve the supply of Stockport. Other speakers having criticized the report, the thanks of the meeting were accorded to the Chairman and Directors, and the proceedings closed.

The half-yearly general meeting of the Truro Water Company was held last Wednesday, under the presidency of Mr. J. C. Daubuz, J.P. The Directors reported that during the six months ending June 30 last the profit realized had been £467. There had been 29 new services and one extra supply connected; the engine had worked 1056 hours, raising 17,634,000 gallons of water, and the water-wheel had raised 6,545,000 gallons. They recommended that a dividend at the rate of 2½ per cent. per annum, amounting to £200, be paid out of the £471 standing to the credit of the profit and loss account; that the sum of £250 be transferred to the capital account; and that the balance be carried forward. The Chairman, in moving the adoption of the report, said it was very satisfactory to see that the demand for water from the Company was steadily increasing; the amount received for its supply during the year showing an increase of £90 over the previous year. They were still continuing the policy of paying the shareholders a small dividend, writing off their capital account over 3 per cent., and carrying the balance forward. They had written £2250 off their capital account, and at the same time they had contributed from the revenue account £351 towards the cost of erecting a water-wheel, pumping machinery, &c. They needed now a duplicate pumping-engine; and it was suggested that this should be procured at a cost of from £800 to £1000. The report was adopted.

THE SURREY COUNTY COUNCIL AND THE METROPOLITAN WATER QUESTION.

At the last Meeting of the Surrey County Council at Kingston, on the Parliamentary Committee reporting that a communication had been received from the London County Council notifying that they had resolved that eight separate Bills should be prepared for the acquisition by the Council of the undertakings of the eight Metropolitan Water Companies,

Alderman YOOL mentioned that the Chairman (Alderman E. J. Halsey) and himself felt that this was a matter of immense importance to the areas of Surrey supplied by the Lambeth and the Southwark and Vauxhall Water Companies; and they therefore called a meeting a week previous of representatives of the ten authorities whose areas were so supplied. The outcome of their deliberations was a unanimous expression of opinion that it was most undesirable that the London County Council should acquire powers to supply water—either in bulk or direct to the consumers—in the Administrative County of Surrey. They were quite unanimous that the London County Council were not the proper body to be entrusted with the supply. He felt most strongly himself that, if they were to yield to the proposal that the London County Council should be allowed to supply water, either direct to the consumers or in bulk to the Surrey County Council, to be afterwards distributed to the consumers, they would be laying up for their successors a heritage of trouble, and an endless source of litigation and strife. At their last meeting they further resolved that, in the event of the London County Council promoting the Bills, such Bills should provide for the Councils and authorities outside the County of London having independent control over the sources of supply, and of so much of the undertakings and works as might be required for the efficient supply of the outside districts. If they permitted the London County Council to obtain control over the sources of supply, they might jeopardize the supply of their own increasing populations in Surrey. At the conference with the London County Council on July 30, in concert with the counties of Middlesex and Kent, they laid these views before the London County Council; and on the part of Surrey, he ventured to say that, if they proceeded with the Bills on the lines indicated, it would be the duty of the Surrey County Council—or at any rate, it would be the recommendation of the Sanitary Committee of the Council—to oppose them in every possible way. But they were by no means opposed to the principle of a municipality acquiring the right of water supply; nor were they opposed to the London County Council undertaking the control of the water supply to their own people. All that they objected to was that the Bills should give London the control over the supply in Surrey. On these lines, the conference broke up; and they were invited by the Chairman of the London Water Committee to formulate a scheme which would be satisfactory to the outside areas. He (Mr. Yool) thought it right to say that they had no scheme formulated; but that they were prepared to give favourable consideration to any scheme that might be formulated on equitable lines by the London County Council. It was for London—with the aid of one of the most able water engineers in the country, and with the great parliamentary experience they had at their control—to formulate a scheme which would be satisfactory to the outer areas. He trusted that the Council would give the fullest support to these views, which were identical with those which he had enunciated on behalf of Surrey at a conference as far back as 1891, and which he trusted would lead to a satisfactory result. He thought it would be very desirable, in the event of the London County Council proceeding with the Bills referred to, that something should be formed in the county of Surrey in the shape of a Joint Water Committee, composed of representatives of those areas which were supplied with the Companies' water. There were powers for the formation of such a Committee under the Public Health Act; and it could be done by Provisional Order. He held distinctly that it was the duty of the Council to assist in every way these ten authorities, if they would allow the Council to assist them. He believed Kingston was rather disposed to act upon its own lines; and he was rather doubtful as to the attitude of Richmond. But the other eight authorities he believed were desirous of having the assistance of the Council. The matter would probably crop up again; and he trusted they would be allowed to proceed on the lines which the Council had already approved.

THE BRISTOL WATER-WORKS.

Among the excursions organized in connection with the recent annual congress of the British Medical Association at Clifton, was one to the Bristol Water Company's works at Barrow. Mr. Alfred J. Alexander, the Secretary of the Company, took the opportunity afforded him by the visit of the large party of members who were present, to read a paper descriptive of the Company's works and powers of supply. He said: The works which you have seen to-day are the storeage reservoirs and the filter-beds of the Bristol Water-Works Company. The Company was called into existence by Act of Parliament in July, 1846. It was not too soon; for the condition of the city of Bristol and the surrounding neighbourhood, as regards water supply, was at that time deplorable. It was estimated that not more than 5000 persons, constituting the most wealthy families in Bristol and Clifton, were supplied by pipes laid into their houses; the remainder of the population having been dependent on wells, the water from which was frequently unfit for use, because tainted by the overflow and soakage from cesspools. The condition of the habitations of the poor was described as extremely filthy, owing to the difficulty of obtaining water; and it was recorded that in some parts of Bristol, to which water was taken by a water-carrier, the charge was 30s. a year to the poorest family. The 5000 persons alluded to as supplied by pipes took water from one of three small works, of which the largest was owned by the Society of Merchant Venturers. The other two were the property of private individuals; and all three obtained their water from local sources. In 1847 the total income derived by the three undertakings from the sale of water was only £1700 a year.

The Company acquired these three works in 1847; closed them; and in place of the water from local sources hitherto distributed delivered the water of the Cold Bath spring, which rises at a short distance from this spot, and is conveyed by iron pipes into Bristol. The district within which the Company were authorized by their first, Act of Parliament to supply water, included the city and county of Bristol, the parish of Bedminster, through which we passed on the way here, and the parishes of St. George on the east, and Westbury-on-Trym on the west of Bristol. Several parishes have since been added to the Company's limits; and the length of the district between extreme points, excluding outlying country parishes, is about 10 miles. The number of persons at this moment supplied is about 300,000; and the revenue derived from the sale of water is over £100,000. Compare these figures with the population supplied 48 years ago, 5000, and the revenue of the three small water-works, £1700 a year, and you will appreciate the growth of the undertaking, and the benefit which the inhabitants of our city have derived from it.

I have mentioned the Cold Bath spring. This water was first delivered in Bristol on the 1st of October, 1847. A very important addition to this source of supply followed in 1850, when water from springs in the carboniferous limestone and the conglomerates of the Mendip Hills was brought into the system. The most distant of these springs rises at Chewton Mendip; and this, with others collected underground at different points, is brought to the Barrow storeage reservoirs by 10 miles of iron aqueduct and tunnel, passing at places at a great depth below the surface of the ground. The difficulties encountered in constructing this long length of aqueduct in the magnesian limestone

rock were very considerable; and the cost far beyond what was estimated. The first and smallest of the three storeage reservoirs was completed in 1852; the second one, adjoining it, was finished in 1868; while the third and largest, not yet quite completed, has been in use since 1891. The total capacity of the three reservoirs will be about 850 million gallons; and the water acreage, when all are full, about 130 acres.

In 1867 a further source of supply was added by pumping from deep wells in the sandstone formation at Chelvey, near Nailsea, about 5 miles from Barrow Gurney. This water can be pumped either into the storeage reservoirs or direct to Bristol. Time will not permit me to give any description of the Chelvey pumping-works, which, however, are very important, regarded in the interests of the Bristol population. The last addition to the source of supply was carried out in 1885, when the water of the Sherborne spring, which rises on the Mendip Hills, was brought to Bristol by 13 miles of iron pipes. This spring, varying in volume from one to one-and-a-half million gallons per day, according to the season, runs straight from its source to the Bristol consumers. These constitute the sources from which the Company draw their present supply. In addition to the works I have named, there are other large reservoirs for regulating the supply of water to the mills on the River Chew; but the water from these works is not supplied to Bristol or any part of the Company's district.

I have now only to mention the fact that the Company have in hand very important extension works in the valley of the Yeo, where a reservoir is in course of construction 1¾ miles in length, with a capacity of about 2000 million gallons. The total expenditure on the works exceeds a million and a half; and the revenue, as already said, exceeds £100,000. The quantity of water delivered daily per head of the population supplied is about 22 gallons; but this includes water consumed for trade purposes. Throughout the Company's district the supply is given on the constant service system. The Company supply some hundreds of houses, containing families of perhaps five to seven persons, for 5s. a year. Contrast this charge with the 30s. a year paid in my lifetime, by the same class of inhabitant, for a pailful of stale water drawn from the carrier's barrel.

You will probably wish to know something of the construction of the filter-beds, which we visited on leaving the storeage reservoirs. They are four in number. The water area of each is about ¾ acre. The embankments are of brick, surrounded by walls of clay—from 3 ft. 6 in. to 4 ft. in thickness. Concrete 6 inches thick is inserted on the bottoms of the filters. Brick drains, leading to a central open-jointed brick channel, are constructed on the concrete floor; and these drains collect and convey the filtered water to the filtered-water tank. The filtering medium is a lower stratum of broken stone, 2 feet thick; and above this 6 inches of finely-broken stone, with a top stratum of sand, 2 feet thick. The sand is obtained from North Devon. The selection of sand for filtering is a matter of much importance. The size of the grains requires close examination—they must not be too small nor too large; and, above all, uniform in size. The late Dr. Tidy expressed the opinion that, if the particles are as nearly as possible of the same size, air spaces between the particles must result, and to such an extent that the air spaces will be almost equal to the space covered by the actual sand. It is generally admitted that sand filtration is superior to any other. It has been described as a process which does not consist merely in the separation of suspended impurities, but, by effecting a minute subdivision of the water, reduces, often very largely indeed, the quantity of dissolved organic matter. It is now recognized that sand filtration removes 98 per cent. of micro-organisms.

The water, as you have seen, is admitted to the filter-bed over a stand-pipe fixed in the centre; and, splashing over the circular table, it becomes aërated. The depth of the water above the surface of the sand is 4 feet. The rate at which the water passes down through the filtering medium is regulated not to exceed two gallons per square foot of filtering surface per hour. In February of last year, Dr. Frankland described efficient filtration as depending first upon the thickness of sand, and secondly upon a coating of something or other which forms on the surface of the filter and arrests microbes from getting into the sand at all. What the nature of this coating is, had not then been determined; and I am not aware that it has been since. It was said to be a film of gelatinous living material on the surface of the filters. As this film plays so important a part in the purification of the water, it should, of course, be disturbed only when necessary. The life of a filter-bed depends on the character of the water filtered—but all filters become choked in time, and require cleaning. The process of cleaning consists in removing a thin slice of the sand surface, and the loosening of the sand below which has become packed hard by the weight of the water. When repeated skimmings from the surface have reduced the sand layer below the requisite thickness, fresh sand is added.

We filter, but mainly to gratify a sentimental desire on the part of consumers; and the Company have expended £30,000, and incurred an annual charge of £500 to £600, for working expenses, to attain this object. I trust our visitors to-day will carry away with them a good impression of the works they have seen, and will bear in mind that, of the many attractions to Clifton as a health resort, the absolute purity of its water supply is by no means the least.

MANCHESTER CORPORATION WATER SUPPLY.

At the Meeting of the Manchester City Council last Wednesday week, the Town Clerk read the following report received from Mr. G. H. Hill, M.Inst.C.E., the Engineer to the Water Committee: "I am now in a position to report that the road across the embankment at the north end of Lake Thirlmere will be completed and ready to be opened for traffic at an early date. It will then be practicable to raise the level of the lake to 20 feet, or to such lesser extent as may be deemed desirable. I therefore propose, when the road is completed, to allow the lake to rise until sufficient water is impounded to enable the supply from Thirlmere to be brought into permanent use within the city and district of supply of the Corporation. Should, however (which I do not anticipate), necessity arise for bringing Thirlmere water in aid of the Longdendale supply, which I am glad to say is of good quality, at an earlier period than that above indicated, I shall be prepared to consider the best means of meeting the difficulty." Mr. Hill proceeded to furnish statistical information as to the supply at Longdendale, and added that he had given instructions for the old reservoir at Prestwich, which had been filled, and remained unused for the purpose of taking observations in regard to evaporation, &c., to be again brought into service. This would to some extent diminish the inconvenience arising in connection with the supply during the hot weather. He had considered, with Mr. Haynes, the question of pressure in the higher districts, which had been to an extent affected by the large consumption of water (more than 31 million gallons a day). Mr. Haynes would endeavour to effect such regulations in the supply as would give the necessary relief.

Alderman Sir J. HARWOOD, in moving the adoption of the proceedings of the Water Committee, said that a year ago they had to shut off the supply of water at eight o'clock at night until five in the morning. Now they had a very large supply of water. Taking the maximum daily consumption per 24 hours at 28 million gallons, and the amount of compensation water in the same period at 14 million gallons, there was now 80 days' consumption of very good water available. What Mr. Hill meant was that, though they could drink Thirlmere water to-day without any difficulty—nothing being required but to turn it on—he would rather fill up the lake. It was very fortunate for them that in Longdendale they had this year 6 inches more rainfall than last year. Half an inch of rainfall upon the 19,000 acres of land at Longdendale practically gave a week's consumption of water; and if it did not rain again for 80 days, they would be able to give 42 million gallons for consumption and compensation. In addition to Mr. Hill's advice that they should fill up the lake, there were other reasons why they should delay using the Thirlmere water. As soon as they began to drink this water, the Corporation would be in beneficial occupation of Thirlmere, and therefore liable to pay all taxes which might come upon them. These taxes would amount to about £8000 or £10,000 a year. They would also have to send a certain number of million gallons of water down the Greta and St. John's Beck. All these things would come with beneficial occupation; and, unless some good purpose could be served, there was no necessity for pushing on the opening of the Thirlmere works. If, however, the necessity should arise, there would be no difficulty whatever in bringing the water to Manchester whenever the Council wished it to be done.

The minutes were adopted.

LANCASTER CORPORATION WATER SUPPLY.

An Additional Reservoir.

At the Meeting last month of the Lancaster Town Council—the MAYOR (Mr. Alderman Gilchrist) in the chair—the Water Sub-Committee reported that, according to a report they had received from the Surveyor, there was sufficient water available for storeage, and running to waste, to justify the construction of an additional reservoir at an early date.

The report of the Surveyor, which had been prepared in compliance with instructions received from the Sub-Committee in May last, contained a number of tabular statements giving the quantity of water coming from the gathering-ground on various days during the past three years. These showed that the springs, excepting in rainy seasons, would not yield the 2,000,000 gallons a day which the Corporation had power to take. The greatest possible quantity of water available from the gathering-ground during the dry summer of 1893, for 65 consecutive days, from May 10 to July 13, was an average of 1,358,000 gallons per day. On 37 days, from May 31 to July 6, the average was only 1,222,250 gallons per day. The highest quantity in any one day during this period was 1,620,940 gallons, on May 25; and the lowest 1,127,450 gallons, on July 6. During the same period, 18,787,000 gallons were drawn from the Damas reservoir; and at the end this reservoir contained only 8,550,000 gallons. Notwithstanding this, the constant supply could not be maintained on 33 occasions. Taking the same period, as extracted from the numerous tables, the water sold by meter daily was as follows: Morecambe, 261,000 gallons; Ripley Hospital and the Asylums, 113,000 gallons; trade meters, 360,000 gallons—total, 734,000 gallons. Adding the domestic consumption, 822,000 gallons, the total was brought up to 1,556,000 gallons. This quantity was an average taken over 65 days, during which time the water was turned off for 33 nights. On May 22, 1893, the consumption by Morecambe reached 350,000 gallons. The Surveyor pointed out the population had grown since the census of 1891. Between 1871 and 1881, the increase was 19·9 per cent.; and between 1881 and 1891, exclusive of out-townships added to the borough by the Act of 1888, it was 28·84 per cent.—equal to about 9 per cent. in the three years 1891-3. The average consumption taken over the whole year 1893 was 1,430,000 gallons per day. This tended to prove that the greatest consumption was upwards of 2 million, and the lowest more than a million gallons per day. The average daily consumption from May 10 to July 13, 1893, did not include water for flushing sewers and watering streets, which had to be discontinued, owing to the scarcity of water. As the result of the information collected by the Surveyor, he came to the conclusion that the time had arrived when additional storeage should be provided. He explained that, if any works were commenced—say, next year—they would require a few years to complete; and the demand for water was steadily increasing.

A short discussion having taken place on a motion to confirm the Committee's minutes,

The MAYOR said he wished to call the attention of the Council to a few figures he had drawn up on the question. He had looked into the report supplied to them; and he gave credit to the Committee for earnestness and sincerity in trying to find out the truth with regard to the water supply. At the previous meeting, figures were not at their disposal. But now they had the statistics; and taking the average of

the three years 1891-3, the quantity gathered, the quantity consumed, and the quantity in excess, they would find the result to be this: The quantity gathered was 2,106,557,000 gallons; the quantity consumed, 1,412,917,000 gallons; and the quantity in excess, or that which was running to waste, 6,093,640,000 gallons. They would see that the excess was very large. If they took the figures for one year, they would find that the quantity of water gathered was 702,185,666 gallons; the quantity consumed, 470,972,333 gallons; and the quantity in excess, or running to waste, 231,213,333 gallons. The basis of this calculation was the average of three years. They would thus be able to judge what a large quantity of water was running to waste; and the Damas Gill reservoir was not capable of holding more than 30,000,000 gallons. The water running to waste was nearly half of the entire quantity sold to consumers. The difference between the waste and the consumption was about four days' supply—viz., 4,217,000 gallons. Dealing with the daily supply, they would see clearly the position they were in with regard to the water service from day to day. According to his calculation, he found that every day they had gathered 1,923,796 gallons of water, used 1,317,001 gallons, and allowed to run to waste 633,460 gallons. What they wanted, and what the Committee had been driving at for the last three years, was to obtain a storeage reservoir sufficient to contain this water. The Committee were alarmed in 1890 by the fact that on 59 occasions during that year their water supply had to be entirely stopped at night. During 1893 it had to be cut off 33 times. This deprivation of water was included in the calculation he had made; so they might assume that if they had had the water at these times, the consumption would have been greater. Having given some additional statistics, he urged the necessity for having a reservoir for storing the water in the rainy season, so as to be available in dry weather.

The minutes were adopted.

Roving Commissions.—The Gas and Water Committee of the Birkenhead Corporation are naturally desirous that both of the undertakings in their charge should be quite abreast of the times; and, in view of the various new processes of gas manufacture now to the front, they asked the Council last Wednesday week to sanction the appointment of a small Sub-Committee to consider the subject, and inspect the works where one of these processes—it did not transpire which—is in operation. Objections were raised to the proposition, on the ground that these deputations were a very expensive amusement. If information were wanted, it would be better, said one member, to get it from experts. Alderman Rawcliffe explained that the Committee were face to face with improvements in gas making, and it was their wish to ascertain which of the new processes possessed the most advantages. But how they were to find this out without examining places for themselves, and seeing what was carried on, he did not know. If the Committee were not to ascertain those facts, what were they to do? Nobody seems to have been able to answer this pertinent question; for we are told that "the subject dropped."

The Adoption of Water Gas in Belfast.—At the meeting of the Belfast Corporation last Wednesday week, the Gas Committee reported, among other matters, that they had accepted tenders for the supply of 6000 tons of refined oil; and Mr. Young, in moving the adoption of the report, stated that the oil had been purchased at a very cheap rate, and that a great saving would be effected. Alderman Pirrie referred in approving terms to the paper read by the Gas Engineer and Manager (Mr. J. Stelfox) at the recent meeting of The Gas Institute; and remarked upon the satisfactory results of the introduction of water gas into Belfast. He suggested that the paper should be circulated among the members of the Council. Mr. M'Cormick said there was no doubt whatever that, in connection with the production of the water gas, the saving was immense. Its introduction had obviated the expenditure of the enormous amount of money which would have been incurred in the extension of the gas-works. At the lowest estimate, half a million sterling would have been spent on the extension; while the water-gas plant only cost some £15,000. Not only was the saving effected in this direction, but gas could now be made in four hours instead of, as formerly, in perhaps forty-eight hours. Alderman Graham pointed out that the introduction of water gas meant that a great many working men would be thrown out of employment. Mr. Young said he took it that the figures in Mr. Stelfox's paper were correct; and they showed that a great saving was being effected. He agreed that the document should be sent to every member of the Council. After some further discussion, the report was adopted.

Arundel Water Supply.—By the generosity of his Grace the Duke of Norfolk, and with the assistance of Mr. A. F. Phillips, M.Inst.C.E., his Grace's Consulting Engineer, Arundel Castle and town have been provided with an efficient water supply. The source of water is a well sunk into the chalk; and the pumping will be done by a water-wheel worked by the overflow from a neighbouring lake, with the assistance of a 9-horse and a 12-horse power gas-engine. In addition to the pumps driven by the wheel, there are two sets of two 10-inch plunger pumps connected with the engines. The machinery is located in a new engine-house, 34 feet by 22 feet. The work of one set of pumps for the supply of the town and castle consists in raising the water from the well, and lifting it into a reservoir through a 6-inch delivery-main at the rate of 252,000 gallons in 24 hours for either engine. This quantity represents a weight of about 1125 tons, which has to be hoisted through a height, measured vertically, of 167 feet. The necessary storeage has been provided by converting two tanks into a single reservoir which will hold 320,000 gallons; and there is also the castle tank, holding 200,000 gallons. Parallel 7 and 6 inch mains from the first reservoir serve respectively the town and the castle; while the two pipes are so connected as to act as alternative or duplicate mains, as needs may require. Still further to provide against mischance, the original 5-inch main has been retained. The supply to Arundel passes through a meter, and then enters the system of mains presented to the town by the Duke. Every street has its main, its controlling-valves, its fire-hydrants, and, it may be, its water-pillar. About 4½ miles of pipes have been laid. The work has been carried out under the supervision of Mr. A. Bard, as Resident Engineer.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

I have just received a copy of the annual report and accounts of the Kilmarnock Gas Corporation; and I must congratulate Mr. W. Fairweather, the Manager, on the amount of the information he gives, and his method of presenting it. Everything is made as plain as daylight. During the past year, 9230 tons of coal, costing on an average 11s. 10d. per ton, was carbonized; and the yield was 83,988,900 cubic feet of gas, 141,978 gallons of tar, and 100¼ tons of sulphate of ammonia. The yield of gas per ton of coal carbonized was 9099 cubic feet; of tar, 15·38 gallons; and of sulphate of ammonia, 24·35 lbs. Gas unaccounted for amounted to 12 per cent.—an increase of 1 per cent., which is accounted for by injury to the mains by a subsidence of the ground. The revenue was £14,867, of which £12,256 was derived from gas, £327 from meter-rents, £618 from char, and £1573 from residual products. There was a gross profit on the year's working of £2478, out of which £1400 was set apart for the repayment of mortgage debentures, which now amount to £22,325; and £750 was applied to extensions. A sum of £351 was carried to profit and loss account, at the credit of which there is now the satisfactory balance of £7752. In consequence of the favourable outcome of the year's working—the return being at the rate of 11·10 per cent. on the capital—the Corporation are able to reduce the price of gas from 3s. 4d. to 3s. 1½d. per 1000 cubic feet, and to abolish meter-rents, two steps which, it is estimated, will reduce their profits about £1100 a year. The undertaking is manifestly well managed all round.

One of the popularly supposed inherent wickednesses of gas—its capability for the destruction of books, pictures, and the like—has been brought home to what is called the Board of Manufactures, the body in Scotland corresponding to the South Kensington Science and Art Department in England. The Board have this week announced that they have reluctantly come to the conclusion that it will be necessary to discontinue the opening of the National Gallery on Saturday evenings during the dark months of the year, in consequence of the very serious injury done to the pictures by the fumes from the gas. The period of the year is now approaching when this resolution must be carried out; but as soon as the return of daylight makes it possible, the Saturday openings will be resumed. It may be stated that the determination of the Board of Manufactures not to open the Gallery in the evenings when gaslight is necessary, is in accordance with the practice of similar galleries elsewhere where pictures are exhibited. That is a serious indictment. Regarding it, it is open to remark that the Board do not seem to have attempted anything in the shape of ventilation to remove obnoxious fumes; and that they do not appear to have considered whether there may not be something in the composition of the colours used by the artists which is disposed to bring about a speedy destruction of works of art. In a lofty gallery, in which the gas lighting arrangements are on a line higher than the topmost picture, and there is headroom above them of about 12 feet there should not be any collection of deadly fumes arising from the burning of gas, unless the management purposely made the interior a reservoir for those fumes by neglecting to provide for their escape. I am afraid the Board have not taken, or have not followed, competent advice on the subject. I say competent, because it is easy to get advice of a sort, from even gentlemen of high qualifications, and yet not to get proper advice. A case in point came under my notice to-day. A large public meeting-place is frequently used for the holding of monster political meetings. On these occasions, the promoters of the meeting make the interior resplendent with decorations, regarding which I may interpolate the remark that I believe no one has ever sought to acquire knowledge as to the flash-point of any of the compositions used. As, however, there was a possibility of some of these added matters taking fire, with a resulting panic and loss of life, the owners of the building, a public body, set about considering the lighting arrangements. It was found that about 16 rings of gas-burners were all served by one gas-pipe; and that one could not be raised or lowered (this being done from the outside) without all the rest being the same. Each ring, of course, had a separate cock upon itself. This was considered to be a bad arrangement, as undoubtedly it was; and the owners consulted a gentleman who should have been able to advise them. The change which has been effected, in my opinion, leaves the lighting arrangements as bad as they were before. The lights are divided into seven groups, each group having a separate supply-pipe; and at the point where they all start, each is controlled by a cock. A man will be stationed by them on occasions of crowded meetings, ready to turn out any of the groups which may be showing elements of danger. So far all is right; but very foolishly the man in charge is to be stationed beside one of the exits. The result would be that, in the event of a panic arising in a crowded audience, he would be hurled from his post in a few seconds; and the lighting would be left entirely uncontrolled. I cite this instance to call attention to the amount of ignorance which prevails among architects and others upon matters of lighting and ventilation, in support of my view that the Board of Manufactures have only sought a way out of the difficulty by one door, and that the closing of the door. They never seem, for one thing, to have heard of the incandescent gas-burner, which, by the way, is admirably adapted for showing colours. The pictures cannot be suffering so much but that one or two seasons of lighting by it might have been tried.

The Gas Company which supplies the village of Eaglesham, a small place of about 1000 inhabitants, in Renfrewshire, has this week been registered as a joint-stock company. The undertaking is a very small one; the capital being only £400, divided into £1 shares. There is this, however, in the Articles of Association, which is being inserted by all new companies, that power is taken to "make and supply gas from oil, coal, or other combustible substances, for lighting and heating." This shows the trend of gas supply in the present day. Evidently there will be no more companies formed with the name "Gas Lighting Company."

The estimates for public lighting in Dundee for the current year amount to £6568, of which £4504 is the cost of gas, £1926 is the cost of cleaning, lighting, extinguishing, and repairing lamps, and £200 is

the cost of lighting the High Street by incandescent electric lamps. As there are four arc lamps in the High Street, the annual cost of maintaining them works out at £50 each, which disposes of the popular notion that such lamps cost only from £20 to £27 a year. There are 4533 gas-lamps; and the cost of gas supply and maintenance to them is £6430, which works out at £1 8s. 4¼d. each a year. Suppose one arc lamp displaced six gas-lamps (which is more than it is found to do in practice), it results that to light the same area of street by electricity costs £50, which can be lighted by gas for £8 10s. 3d.—a difference in favour of gas lighting of £41 9s. 9d. for each arc lamp in use.

The accounts of the electric lighting department of the Glasgow Corporation have been made up by Mr. James Fleming, the Treasurer. They show that, during the year ending the 31st of May, 854,766 units of electricity were generated at the John Street and Waterloo Street stations, of which 543,178 units were sold to private consumers, 159,070 units were used in public lamps, and 13,326 units were used on the works. There were thus lost by leakage 139,192 units, or 16·28 per cent. In the 15 months preceding, the leakage amounted to 26·15 per cent. The revenue for the past year was £18,015, of which £15,818 was derived from sales to private consumers, £1692 from public lighting, £290 from the hire of meters, and £214 from hiring out electric machines. The expenditure upon the working of the station, including rents, rates, and taxes, amounted to £9592; and there was allowed for depreciation £4393. There was thus a balance for the profit and loss account of £4030. The Corporation have borrowed £120,000 at 3¼ per cent., from their own loans fund for the purposes of the undertaking; and they have repaid none of the loan, no profit having yet been made. They have therefore to pay interest upon the full sum, and to place £1200 to the sinking fund, out of the £4030. The Treasurer brings out a loss of £607 upon the year's working, as compared with a loss of £1773 in the preceding 15 months. This deficit is to be made good out of gas profits, as was the case last year. The accounts are considered to be so favourable that it is proposed to reduce the charge for electric current from 7d. to 6d. per unit. I confess I do not see how the Treasurer brings out a deficit of £607; but, of course, it must be correct, as the accounts have been certified by the Auditor. I should, however, if the figures above are reliable, make it out to be £1070, accounted for as follows: £3900 for interest on £120,000 at 3¼ per cent., and £1200 to sinking fund, making together £5100, from which the £4030 would fall to be deducted. As regards depreciation, I may point out that it is at the rate of 26½ years' purchase. This is interesting as a question of finance, because there is little data upon which to proceed in fixing the rate of depreciation of electric lighting plant; and it must be more or less hap-hazard. I know one instance of a private installation which, working only a few hours nightly, was worn out in 13 years. Of course, it may not have been properly looked after; but against this there is to be placed the short lighting period. I have looked up the gas accounts; and I find that the depreciation upon gas plant in Glasgow works out, according to the present liabilities of the Gas Trust, at 33 years' purchase.

The Scotch coal strike is still in existence. During the week symptoms have developed which point in the direction of a partial settlement, with, of course, the prospect of a complete settlement later on. These consist of the understanding (for I do not think it is as yet an agreement) that those of the masters who are not in the Association should be allowed to reopen their pits at whatever rate of wages might be agreed upon. Before any arrangement can be come to, it is necessary to consult the men; and that is being done now. The proposal was put forward at a meeting of the Miners' Federation yesterday that, in cases where the masters agreed to give back 6d. of the 1s. reduction, the men should be allowed to work. This was opposed by some of the men's leaders, but was carried by a small majority. The proposal, it may be said, is supported by the Miners' Federation of Great Britain, who favour the resumption of work at the 6d. compromise, provided it be undertaken that wages will not be interfered with for 18 months. In that case, the Federation are willing to recognize the 6d. as a concession of the minimum wage. Their demands are very elastic. When the strike began, nothing less than the restoration of the whole 1s. per day was regarded as making a minimum wage. How they have been brought to lower their demand is not difficult to understand. The miners in England are evidently getting tired of subscribing towards the support of their Scotch brethren, as is shown by the lessening of the contributions—the last contribution, paid to-day, being only at the rate of 1s. 1½d. per man per week—and if that goes on, there will soon be nothing at all coming from England. Therefore it is much better to endeavour to secure half than to lose all. That is evidently their attitude. As stated above, it is strongly opposed by those who were foremost in promoting the strike, whose policy is "no compromise." There is thus a split among the men's leaders. This would soon bring the dispute to an end, were it not that at the same time the masters are not united. Those who are non-associated are prepared to negotiate for a compromise; while those who are associated will listen to no proposals for settlement other than a resumption of work at the rate of wages which existed when the strike began. This sort of cross-purpose situation is, no doubt, a complication. I think, however, the issue is not doubtful. The men are nearly equally divided (or at least their leaders are); while the masters are in this position—that there are very few outside their Association. There is thus likely to be a greater amount of firmness among the associated masters than among the men; and a few weeks' firmness would have a powerful moral effect upon men who, though they may have been enjoying a good holiday, must be getting tired of it now, and cannot be expected to appreciate much longer existence upon little more than 1s. a week. Two or three more weeks, I confidently expect, will see the men clamouring to get back to work on the masters' terms.

Rangoon Water Supply.—The high-pressure water-works which have been in course of construction for about nine months for the supply of Rangoon with water have been formally inaugurated. They draw water from the lowest level of the lakes; giving thereby 500 million gallons additional supply, and averting the danger of a water famine.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Aug.* 11.

Sulphate of Ammonia.—The signs of life are scanty; and so far the expected revival after the holidays has not taken place. Still there is sufficient inquiry to warrant the anticipation of a better tone presently; and it is needless to repeat that supplies are far from plentiful, especially as the continuance of the strike of Scotch miners curtails greatly the output in the North. That an improved demand must set in shortly, nobody attempts to deny; and it would be contrary to all past experience if the bad state of trade, and the by no means flourishing condition of the farmer through low prices of produce, were to interfere with the regular consumption of manures. Purchases, as is well known, have, owing to the prevailing high prices, been postponed in the hope of a falling market; but this abstinence has only lowered the level of values slightly, much to buyers' surprise. Quotations remain quite unchanged.

LONDON, *Aug.* 11.

Tar Products.—Benzols remain exceedingly weak; and very little business is being done. Fifties are nominally about 1s., and nineties about 10½d. Solvent naphtha is not so firm, and is 1d. to 1½d. per gallon lower in price. Pitch is in good demand; and higher prices are being paid both for prompt and early forward. Carbolic acid is more inquired for, but at a very slight advance in price—less than might have been expected from several circumstances which at present tend to a greatly increased consumption. Cresylic is quiet, and at about the same price as last quoted. Prices are as follows: Tar, 14s. to 19s. Pitch, 31s. to 33s. Benzol, 90's, 10½d.; 50's, 1s. Solvent naphtha, 1s. 3d. Creosote liquid, 2½d.; ordinary, 2d. Creosote salts, 20s. Cresylic acid, 1s. Crude benzol naphtha, 30 per cent., 5d. Carbolic acid 1s. 7d. Anthracene, "A," 1s. 1d.; "B," 10d.

Sulphate of Ammonia.—Very little business has been done; but, notwithstanding this, no further fall has taken place in price. The stocks are low, and the demand during the next few weeks should greatly stimulate the price. Business has been done at prices ranging from £13 12s. 6d. to £13 15s., less 3½ per cent. Gas liquor is quoted at 10s. 6d. to 12s.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—As indicated in previous reports, the wages settlement, with the 10 per cent. reduction on the rates now being paid to the miners, has necessarily a tendency to weaken prices. The leading Manchester colliery concerns, as reported last week, are endeavouring to hold on to late rates, and have not issued any actually reduced lists; but there is an understanding amongst them that they should have what may be termed a free hand in meeting competition from outside quarters, which really means that since the commencement of the month there has been a giving way in some markets upon round coal of 5d. per ton. As regards engine fuel, prices are quoted very much according to circumstances. In other Lancashire districts there is also some easing down in prices, although it is exceptional where there is any actually announced reduction; and the whole tendency is in favour of buyers. Stocks here and there are being pushed for sale at reduced figures; and Yorkshire and other important neighbouring mining centres are competing here at very low prices. All descriptions of round coal are difficult to move, so far as inland demand is concerned. It is exceptional where more than 11s. is now being got for best Wigan Arley; 10s. for Pemberton four-feet and seconds Arley; 8s. for the medium qualities of round coal; and 7s. per ton for steam and forge coals, at the pit mouth. The depressed condition of the cotton trade and other manufacturing industries is necessarily causing but a very limited demand for engine classes of fuel; and slack is becoming more and more plentiful in the market, with extremely low figures taken in some instances. Inferior descriptions of slack could be bought as low as 3s. 6d. to 4s.; with ordinary medium qualities, about 4s. 6d. to 5s.; and the very best descriptions, about 6s. per ton at the pit mouth. The shipping demand continues fairly good; but this is chiefly on account of requirements for Scotland, and both round coal and engine fuel are moving off in tolerably large quantities in the above direction. Common round coals, however, do not realize much more than about 9s. per ton delivered at the ports on the Mersey; but for slack rather better prices have been got, and 4s. 6d. to 5s. have been about the average figures for delivery at Garston Docks or the High Level, Liverpool.

Northern Coal Trade.—There has been an increased demand for coal during the last few days; and prices have rather advanced. In part, the increase is due to the enlarged needs of the Scotch consumers, whose stocks have been exhausted. The demand from the North was at first almost entirely for locomotive and manufacturing coal; but there is now an inquiry for gas coal also from that quarter, though at the present time it can be very readily met. Best Northumbrian steam coal is quoted at 11s. per ton f.o.b.; and the demand is sufficient to give full employment to all the collieries. Second-class steam coal is 10s.; and steam smalls vary from 4s. 9d. to 5s. per ton. Gas coals are now in rather fuller request generally; and some of the large buyers are taking advantage of the very low range of steamship freights to increase their stocks. The price varies from 7s. 3d. to 8s. per ton f.o.b., though both higher and lower rates have in some cases been named. For manufacturing coals, the demand is good; but the prices are not materially altered, strikes locally throwing coal into the market, so that the exceptional demand from Scotland can be thus met. In coke a good demand prevails for best blast-furnace qualities for local use; but the exports are limited. The price generally quoted is from 13s. 6d. to 14s. 6d. per ton f.o.b. Gas coke is unaltered in price. The stocks are generally very small now; but it must be expected that the consumption will speedily increase.

Scotch Coal Trade.—There is nothing new to say about the coal trade in Scotland. Though the strike of miners has now lasted seven weeks, there is still coal in Scotland to dispose of, more especially in

Fifeshire, where the stocks seem to have been particularly large. The price, too, cannot be said to be high, as it has only risen about 4s. per ton for all varieties; being now, for retail purposes, from 16s. to 17s. per ton. The low prices are, of course, due to the large influx of English coal, which is, in fact, cheaper to buy than is Scotch coal at present; the price for it, in the Glasgow district, delivered by sea, being from 15s. to 16s. per ton. Large consumers, such as railway companies, are, of course, getting coal from England cheaper. The shipments, mostly for steamers' bunk purposes, show that there is still coal to be had; but some of it may be English coal re-exported. During the week they amounted to 23,971 tons—an increase on the preceding week of 375 tons, but a decrease on the corresponding week of last year of 146,714 tons. For the year to date, the total shipments have been 3,716,583 tons—a decrease, as compared with the same period of last year, of 348,397 tons.

Death of Mrs. Porter, of Elland.—The death is announced of the wife of Mr. Robert Porter, the Manager of the Elland (Yorks.) Gas-Works, after a long and painful illness. Mrs. Porter was born at Halifax in 1853; her father then being the Water-Works Engineer to the Halifax Corporation. He subsequently removed to Blackpool, to take the management of the Poulton-le-Fylde Water-Works Company; and, although a quarter of a century has elapsed since then, the family have many friends in Halifax and its neighbourhood, who deeply lament Mrs. Porter's death.

Accident at the Keighley Gas-Works.—The extension of the retort-settings at the Keighley Gas-Works, which has been going on for some time, was checked on Friday by an accident which will cause several weeks' delay. There are in all ten new arches being put up, with a chimney 9 feet square in the middle. It appears that the contractor for the brickwork had placed four props, by way of support, between the wall of the most westerly arch and the outer wall of the old works; and it is reported that one of the workmen in the employ of the contractors for the ironwork, with the view of facilitating the erection of the buckstaves, injudiciously knocked away the props. The effect of this was the almost immediate collapse of the five arches on the western side of the chimney—the outermost wall giving way first, and the others falling in rapid succession. One workman was partially buried in the fallen brickwork; but he was only slightly injured.

The Electric Lighting of the Houses of Parliament.—In the House of Commons last Friday, Mr. H. Gladstone, replying to Mr. Weir, stated that the matter of providing the Houses of Parliament with an electric installation had received careful consideration. The evidence before him showed that no complete installation of electric lighting machinery and plant could be established within the building without occasional serious interference with its proper ventilation; and they had already had some experience with a partial installation which confirmed this view. The generation of electricity within the building had been abandoned, both for this reason and because the boilers now existing were no longer strong enough to bear the strain of working both the ventilating and lighting systems. The cost of constructing a complete electrical station outside the building in connection with the warming and ventilating arrangements had been considered, and it would probably reach £30,000 or £40,000; while the expense of wages and maintenance would also be very heavy. The subject would have further attention; but, having regard to all the circumstances of the case, it must be deferred for the present.

The Gravesend Corporation and the Water-Works.—At the last meeting of the Gravesend Town Council, Mr. Berkowitz moved—"That this Corporation do proceed without delay to acquire the undertaking of the Gravesend and Milton Water-Works Company; and in the event of negotiations with the Company not being successful, that the Town Clerk be instructed to take the necessary steps in the next parliamentary session to acquire compulsorily the said undertaking of the Company." He said he believed the time had arrived when Gravesend should follow the example of several other towns, and take steps to control the supply of water to the borough, as, in doing so, they would be protecting the interests of the public, and commanding the confidence of the consumers. If the water-works were in the hands of the Corporation, he believed greater efficiency, economy, and equality of charges would be obtained than now existed. The health of the community was his primary consideration in moving in this matter. From a sanitary point of view, it was desirable that the Corporation should have control of the water-works, in order to afford the town a constant supply, to enable consumers to obtain pure water direct from the mains, and not to have to use cisterns which were more or less foul. Alderman Russell seconded the motion; and, after a brief discussion, it was carried, with one dissentient.

Rotherham Water Supply.—A Sub-Committee of the Water Committee of the Sheffield Corporation recently had under consideration the subject of the supply of water to Rotherham and the resources of the Sheffield water undertaking; and they expressed the opinion that the Water Committee might wisely recommend the Council to offer a supplementary supply of water to the Rotherham Corporation on the following terms: (1) A minimum of 100,000 gallons per day throughout the year to be guaranteed, and at present the maximum not to exceed 250,000 gallons per day, and in any one day. (2) The water to be taken through a meter belonging to the Sheffield Corporation, to be fixed at the boundary of the Rotherham borough at Tinsley Road. (3) The price to be 1s. per 1000 gallons for any quantity up to 125,000 gallons per day, and 11d. per 1000 gallons for all excess beyond 125,000 gallons up to 250,000 gallons per day. (4) An agreement to be entered into between the two Corporations to contain the above and such other usual conditions as the Water Committee might be advised were necessary. The Committee agreed to this report; and at the meeting of the Council last Wednesday, they recommended its adoption. The Deputy Town Clerk, however, read a letter received from the Town Clerk of Rotherham, in which it was stated that the Rotherham Council feared that further negotiations would be of little avail, as they considered the price asked was practically prohibitive.

The Colyton Gas, Coke, and Coal Company, Limited, has been registered with a capital of £1500, in £5 shares, to supply gas, coke, and coal in the neighbourhood of Colyton, Devon.

The Proposed Adoption of Electric Lighting at Winchester.—This question came again under discussion at the last quarterly meeting of the Winchester Town Council, when by nine votes to seven (with one member neutral) it was decided to proceed with an electric lighting experiment. A report of the Joint Committee of the General Purposes and Electric Lighting Committee, embodying proposals of the Gas Company and the Brush Electric Lighting Company respectively, was submitted; and it was on this that the discussion took place. The Committee recommended that the Council should take steps to obtain a Provisional Order for the public and private lighting of the city according to the system suggested by the Brush Company. The Mayor (Alderman Stopher) pointed out that the report was incomplete, and he furnished the figures—155 lamps of 16-candle power for side streets, 142 lamps of 32-candle power for main streets, and 14 lamps of 50-candle power, with 133 oil-lamps as at present costing £2 5s. each, making a total of £1020. The ex-Mayor, in moving the adoption of the report, entered at length into the question, pointing out what he considered were "the advantages, economical and otherwise, of electricity over gas, and the benefits accruing by the obtaining of a Provisional Order at a cost of about £250." Mr. Kirby considered the Gas Company's offer a fair and reasonable one, in requiring a five years' contract to recoup themselves. He thought they should wait till they saw the electric system in active operation before they entered upon it; and he asked for the names of places where it could be seen at work at the present time. Alderman Budden characterized the report as meagre with only one relic—that of £11 on account of the Committee's visit of inspection to Bournemouth. Mr. Marks supported the report, though he would sooner continue oil lighting than increase the rates. Other members having expressed their views, Alderman Warren pointed out that all they were asking for was the cost of the Provisional Order; so as to protect themselves and get the system, when introduced, into their own hands. It was stated that the cost of procuring the Order would amount to £250; and that to carry out the electric lighting scheme, it would be necessary to obtain borrowing powers for £25,000.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 321.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	12 Apl.	10½	Alliance & Dublin 10 p. c.	10	18—19	..	5 10 6
100,000	10	,,	7½	Do. 7 p.c.	10	12½—13½	..	5 11 1
300,000	100	2 July	5	Australian (Sydney) 5 % Deb.	100	105—107	..	4 13 4
100,000	20	14 June	8	Bahia, Limited	20	9½—10¼	..	15 3 10
200,000	5	11 May	6½	Bombay, Limited	5	5¼—5⅜	..	5 13 0
40,000	5	,,	6½	Do. New	4	4—4¼	..	5 15 6
380,000	Stck.	28 Feb.	11½	Brentford Consolidated	100	227—232	+2	4 19 1
180,000	,,	,,	8½	Do. New	100	175—180	+2	4 14 5
220,000	Stck.	15 Mar.	11½	Brighton & Hove Original	100	210—215	..	5 6 11
888,500	Stck.	28 Feb.	5	Bristol	100	113—116	..	4 6 2
320,000	20	29 Mar.	11½	British	20	47½—48½	..	4 12 9
50,000	10	28 Feb.	11½	Bromley, Ordinary 10 p. c.	10	21½—22½	..	5 2 2
51,510	10	,,	8½	Do. 7 p. c.	10	16½—17½	..	4 17 2
328,750	10	28 June	2	Buenos Ayres (New) Limited	10	5⅛—5⅜	—⅛	3 9 7
200,000	100	2 July	6	Do. 6 p. c. Deb.	100	99—101	+½	5 18 10
150,000	20	12 July	8	Cagliari, Limited	20	25¼—26¼	..	6 0 8
550,000	Stck.	12 Apl.	12½	Commercial, Old Stock	100	265—270	+2	4 12 7
165,000	,,	,,	9½	Do. New do.	100	195—200	..	4 15 0
160,762	,,	14 June	4½	Do. 4½ p c. Deb. do.	100	132—137	..	3 5 8
800,000	Stck.	14 June	13	Continental Union Limited	100	237—242	..	5 7 5
200,000	,,	,,	10	Do. 7 p. c. Pref	100	210—215	..	4 13 0
535,000	Stck.	28 Feb.	5	Crystal Palace Ord. 5 p.c. Stk	100	107—112	+2	4 9 2
486,090	10	27 July	11	European, Limited	10	23—24*	..	4 11 8
354,060	10	,,	11	Do. Partly paid	7½	16—17*	..	4 17 1
5,646,590	Stck.	14 Feb.	12	Gaslight & Coke, A, Ordinary	100	250—255	+5	4 14 1
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	100—104	..	3 16 11
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	275—280	..	3 11 5
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	130—135	..	3 14 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	190—195	..	3 16 11
1,300,000	,,	,,	7	Do. H, 7 p. c. max	100	180—185	..	3 15 8
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	274—279	+2	3 11 9
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	167—172	..	3 9 9
1,061,150	,,	14 June	4	Do. 4 p. c. Deb. Stk.	100	127—130	..	3 1 6
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	132—137	..	3 5 8
908,000	,,	,,	6	Do. 6 p. c. do	100	175—180	..	3 6 8
3,800,000	Stck.	11 May	12	Imperial Continental	100	223—228	+1	5 5 3
75,000	5	14 June	6	Malta & Mediterranean, Ltd.	5	4½—5⅛	+⅛	5 14 3
560,000	100	2 Apl.	5	Met. of Melbourne, 5p. c. Deb.	100	109—111	..	4 10 1
541,920	20	14 June	5	Monte Video, Limited	20	14½—15½	..	6 9 0
150,000	5	30 May	8	Oriental, Limited	5	6¼—6⅝	..	5 18 6
60,000	5	29 Mar.	7	Ottoman, Limited	5	3¾—4¼	..	7 7 4
166,870	10	31 Jan.	2	Pará Limited	10	1⅞—2	..	10 0 0
420,000	100	2 May	6	People's Gas of Chicago— 1st Mtg. Bds.	100	102—107	..	5 12 1
500,000	100	1 June	6	2nd Do.	100	95—100	..	6 0 0
150,000	10	26 Apl.	6	San Paulo, Limited	10	9—10	..	6 0 0
500,000	Stck.	28 Feb.	15½	South Metropolitan, A Stock	100	323—328	+1	4 14 6
1,350,000	,,	,,	12	Do. B do.	100	272—277	+2	4 6 8
260,000	,,	,,	13	Do. C do.	100	280—285	+2	4 11 3
750,000	,,	12 July	5	Do. 5 p. c. Deb. Stk.	100	155—160	..	3 2 6
60,000	Stck.	28 Feb.	11½	Tottenham & Edm'nton, "A"	100	215—220	..	5 4 7
				WATER COMPANIES.				
746,011	Stck.	28 June	10	Chelsea, Ordinary	100	283—288	..	3 9 5
1,720,252	Stck.	12 Apl.	8	East London, Ordinary	100	228—233	..	3 8 9
544,440	,,	28 June	4½	Do. 4½ p. c. Deb. Stk.	100	147—152	..	2 19 2
700,000	50	14 June	8½	Grand Junction	50	119—123	..	3 9 1
708,000	Stck.	28 Feb.	12	Kent	100	302—307	+4	3 18 2
1,043,800	100	28 June	9½	Lambeth, 10 p. c. max.	100	258—263	..	3 12 3
406,200	100	,,	7½	Do. 7½ p. c. max.	100	207—210	..	3 11 5
350,000	Stck.	29 Mar.	4	Do. 4 p. c. Deb. Stk.	100	132—135	..	3 19 3
500,000	100	14 Feb.	12½	New River, New Shares	100	380—385	+3	3 3 0
1,000,000	Stck.	27 July	4	Do. 4 p. c. Deb. Stk	100	134—137*	..	2 18 4
902,300	Stck.	14 June	6	S'thwk & V'xhall, 10 p. c. max.	100	168—173	..	3 9 4
126,500	100	,,	6	Do. D 7½ p. c. do.	100	149—152	..	3 19 0
1,155,066	Stck.	14 June	10	West Middlesex	100	273—278	..	3 12 0

*Ex div.

Windfall for a Leeds Gas Stoker.—A man of the name of Henry Kitchen, of Tong Road, New Wortley, Leeds, has received information that, by the death of his mother, he has become entitled to a fortune, variously stated at from £7000 to £20,000. Kitchen was formerly employed at the New Wortley station of the Leeds Corporation; and he was one of the few men who refused to join the strikers. He is stated to have kept himself apart from the other men when employed at the gas-works; but since he has come into his fortune he has befriended several of his old fellow-stokers.

Liabilities of Gas Companies.—At the Liverpool Summer Assizes, on the 2nd inst., the case of *Comberbatch v. Liverpool United Gas Company* came before Mr. Justice Bruce and a special jury. It was a claim by the plaintiff for damages for personal injuries sustained through the alleged negligence of the Company. He was walking across the pavement near his house when his toe caught in a hole, 2½ inches in diameter, containing a spindle for turning the gas on and off; and he fell, and broke a bone in his shoulder. The jury awarded him £100; but his Lordship reserved judgment. On the following day, Mr. Percy Morris, on behalf of the Company, said that, the jury having found that the hole was dangerous as originally constructed, it was difficult to resist judgment, except on one point—viz., that the Company were entitled to put into the pavement such fittings as they might deem necessary for regulating the supply of gas. If, of necessity, the fittings must to a certain extent be dangerous, it followed that the Act of Parliament authorized the danger. He contended that of two kinds of fittings the Company had chosen the less dangerous. His Lordship said he could not say that the holes could not be made so as not to be dangerous to the public. He was quite sure that mechanical science was equal to the emergency; and unless it was absolutely necessary that they should be dangerous, the Act of Parliament did not authorize them. The question of whether the Company could have prevented the accident by the exercise of reasonable care having been left for his decision, he could not find that, if their attention had been drawn to the matter, there would have been any difficulty in plugging the hole, or otherwise removing the danger. He must give judgment for the plaintiff for £100, with costs.

The Corporation of Cheltenham and the Tewkesbury Water Supply.—Sir G. Bruce, the Arbitrator in the dispute between the Corporations of Cheltenham and Tewkesbury, on the subject of the supply of water by the former to the latter, recently had the parties before him to endeavour either to come to an amicable arrangement of the terms of his award, or to agree to an enlargement of the scope of the reference to arbitration to cover the whole matter in question. The Arbitrator was appointed under the provisions of the Cheltenham Water-Works Act, 1878, to decide the price at which water should be supplied by the Cheltenham Corporation, as owners of the Tewkesbury Water-Works, to the Corporation of Tewkesbury. Under the Act stated, Cheltenham had until September last supplied water to houses within the borough of Tewkesbury upon the rating of each property taking the supply; but at that date, being the limit of 15 years allowed by the Act, the Tewkesbury Corporation exercised their option to take the water required within their area in bulk, they supplying and rating the consumers. The negotiations between the two Corporations having failed in arriving at a basis of arrangement, formal arbitration ensued. Sir G. Bruce held an inquiry in May last, as reported in the JOURNAL at the time; taking evidence and hearing arguments on both sides. During that inquiry, it was suggested by Counsel for Tewkesbury that it would be desirable to fix (1) a term of years over which the award should operate, and (2) a minimum amount or dead rent to be paid by Tewkesbury. These suggestions were acquiesced in by Counsel for Cheltenham; but Tewkesbury then required a reference back to the respective Corporations for further negotiation. Since the inquiry, there had been much correspondence between the two bodies, but without satisfactory result, through a claim by Tewkesbury to retain the right of reverting to a supply in detail at any time, notwithstanding agreement as to the term of years over which the award as to supply in bulk should operate. Correspondence having thus failed, the Arbitrator, as already stated, invited the parties again before him, in the hope that the difficulty might be removed in conference. After a long discussion, it was found to be impossible to come to an agreement; and consequently the Arbitrator will make his award on the facts submitted to him.

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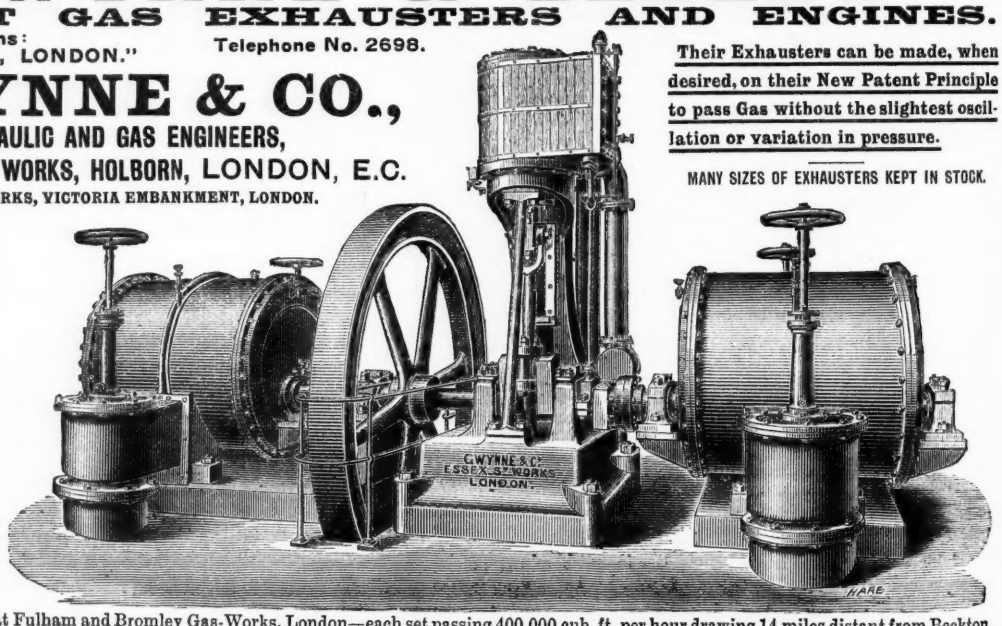

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REDHILL GAS-WORKS ASSESSMENT APPEAL.

THE Report of the proceedings at the hearing of the APPEAL of the REDHILL GAS COMPANY against the RATING OF THEIR PROPERTY in Reigate and Nutfield which was published in the JOURNAL has been reprinted (by desire) in Pamphlet form; and copies can be obtained, on application to the PUBLISHER, *price 4d. each.*

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For Particulars apply to the SECRETARY, Ludlow Union Gas Company, 14, Broad Street, Ludlow, SALOP.
Aug. 7, 1894.

COUNTY BOROUGH OF BURNLEY.

THE Gas Committee of the Corporation of Burnley require the Services of an ANALYTICAL CHEMIST at their Gas-Works.
Salary, £80 per annum.
Applications, stating age, qualifications, and references, to be sent to the undersigned, on or before the 28th inst.
JNO. P. LEATHER.
Gas-Works, Burnley,
Aug. 10, 1894.

OFFICINA COMUNALE DEL GAS ILLUMINANTE, TRIESTE.

NOTICE is Hereby Given, that the Municipal Gas-Works (Officina Comunale del Gas Illuminante), making 6 Million Cubic Metres of Gas per Annum, requires the services of a MANAGING DIRECTOR.
Applicants must have acquitted themselves creditably at a Technical High School; must have already managed a Gas-Works of well-known standing; and are required to be acquainted with the Italian language. Preference will be given to persons with experience in Electrical Engineering and Water Supply.
Applications to be sent before the 10th of September next, to the Gas-Works Committee (Consiglio d'Amministrazione) in Trieste, Via del Campanilo No. 6, where further particulars may be obtained.

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State kind, condition, lowest price on rails, and where to be seen, to T. DUXBURY, Gas Engineer, DARWEN.

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STOCKTON-ON-TEES CORPORATION.

TENDERS FOR GAS COAL.

THE Gas Committee of the above Corporation invite TENDERS for the supply, in whole or in part, of 30,000 tons of GAS COAL, for the Year ending Aug. 31, 1895.
Particulars and Form of Tender can be obtained on application to the undersigned at the Gas-Works.
Tenders, sealed, and endorsed "Tenders for Gas Coal," to be sent in not later than noon of the 29th day of August, 1894, addressed to M. B. Dodds, Esq., Town Clerk, Stockton-on-Tees.
The Gas Committee do not bind themselves to accept the lowest or any tender.
WILLIAM FORD,
Engineer and Manager.
Stockton-on-Tees,
Aug. 4, 1894.

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THE Lighting and Water Committee of the above Corporation invite TENDERS for the spuply and delivery during the Twelve Months ending the 31st day of August, 1895, of
(1) SULPHURIC ACID.
(2) WET AND DRY METERS.
(3) CAST-IRON GAS AND WATER PIPES.
Specifications and Forms of Tender may be obtained on application to the Gas Engineer, Mr. Chas. A. Craven, Gas-Works, Savile Town, Dewsbury.
Tenders, under sealed covers, endorsed "Sulphuric Acid," "Meters," or "Cast-Iron Pipes," as the case may be, to be sent to me not later than Saturday, the 18th inst.
The Corporation do not bind themselves to accept the lowest or any tender.
By order,
E. MAWDESLEY,
Town Clerk.
Town Hall, Dewsbury,
Aug. 8, 1894.

CORPORATION OF LEICESTER.

SULPHURIC ACID.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the supply of SULPHURIC ACID, made either from Native Sicilian Brimstone, recovered Sulphur, or Pyrites.
Specific gravity in each case to be stated. The Price to include free delivery by rail into elevated tanks, 27 feet high, at the Chemical Works, Aylestone Road Gas-Works. Probable quantity, about 1200 tons, to be delivered as required during the ensuing Twelve Months.
Tenders, addressed to Alderman Lennard, Chairman, and endorsed "Tender for Acid," to be delivered at these Offices not later than Eleven o'clock a.m. on Tuesday, Aug. 21.
The Committee do not bind themselves to accept the lowest or any tender.
ALFRED COLSON, M.Inst.C.E.,
Engineer and Manager.
Gas Offices: Millstone Lane, Leicester,
Aug. 4, 1894.

TO TAR DISTILLERS.

THE Directors of the Wakefield Gaslight Company are prepared to receive TENDERS for the purchase of surplus TAR produced at their Works for the period of Twelve Months, commencing the 1st of September next.
Estimated production, 1500 tons.
Tenders to be sent in, endorsed "Tender for Tar," not later than the 18th day of August.
By order,
JOHN W. WHITAKER,
Manager and Engineer.
Gas Office, Warrengate, Wakefield,
Aug. 13, 1894.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

GOLD MEDAL, 1892.

TUBES and Fittings for Gas, Steam, and Water, in stock to 8 inches diameter; Iron and Steel Ascension-Pipes.
JOHN SPENCER, Globe Tube Works, WEDNESBURY; and 14, Great St. Thomas Apostle, LONDON.

CHARTERING, FORWARDING, AND INSURANCE.

ROBERT BRUCE FITZMAURICE, 29, Great St. Helens, London, Shipping Agent to several Gas Companies and Plant Manufacturers, would be glad to UNDERTAKE LARGE or SMALL SHIPMENTS to any Port.

HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works Sundries. (See last week, p. 301.)
Telegrams: "HUTCHINSON BROS., BARNSLEY."

THE Directors of the Cork Gas Consumers' Company are prepared to receive APPLICATIONS from Persons competent to take charge of the Distribution Department, and all Outside Work of the Company.
Applicants to state Age, Experience, Salary required, and further Particulars, by letter addressed to the Secretary.
By order,
DENNY LANE,
Secretary.
72, South Mall, Cork,
July 27, 1894.

GREAT WIGSTON GAS COMPANY.

TENDERS FOR COAL.

THE Directors invite Tenders for the supply of from 1000 to 2000 tons of Best Screened GAS COAL, delivered at the Railway Station, Wigston, for Twelve Months ending Aug. 31, 1895, in such quantities as the Manager shall from time to time order.
No special Form of Tender provided.
Tenders to be addressed to the Chairman not later than the 25th.
The Directors reserve to themselves the right to accept the lowest or any tender.
JOHN A. HARRIS,
Manager.

RAMSGATE CORPORATION.

(GAS AND WATER DEPARTMENT.)

THE Gas and Water Committee invite TENDERS for the supply of about 110 tons of Best BRIMSTONE ACID (what is known as 80 per cent. Acid, with a Specific Gravity of 142° Twaddel), to be delivered, in equal Monthly quantities, between the 1st of September next and the 1st of September, 1895.
Tenders to be sent in, addressed to the Chairman of the Gas and Water Accounts Committee, on or before Noon, on Monday, Aug. 27, endorsed "Tender for Sulphuric Acid."
The Committee do not bind themselves to accept the lowest or any tender.
Full Particulars on application to
WILLIAM A. VALON,
Engineer.

BRENTFORD GAS COMPANY.

SALE BY TENDER OF £30,000 NEW STOCK, 1881.

IN Pursuance of the Brentford Gas Order, 1881, NOTICE IS HEREBY GIVEN, that it is the intention of the Directors of this Company to Sell BY TENDER £30,000 of NEW STOCK, 1881, of the Company, to be paid up in full on or before the 1st day of October next, such Stock being a portion of Additional Capital authorized to be raised by resolutions passed at an Ordinary Meeting of Proprietors, held on the 21st day of February, 1890, under the powers of the above-mentioned Order.
Particulars and Conditions of Tender may be obtained on application at this office; and sealed Tenders must be sent in not later than Twelve o'clock (Noon) on Monday, the 10th day of September next.
By order,
WM. CROXFORD,
Secretary.
Office, Brentford Gas Company, Brentford,
Aug. 10, 1894.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the ANNUAL ORDINARY GENERAL MEETING of the Proprietors in this Company will be held at the Offices, Willoughby Lane, Tottenham, on Saturday, the 25th day of August inst., at Half-Past Three o'clock in the Afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended June 30 last, to Declare a Dividend, for the election of two Directors and an Auditor for the ensuing Year, and for transacting General Business.
The Transfer Books for Consolidated Stocks will be closed from the 10th to the 27th inst., both days inclusive.
By order of the Board,
JAMES RANDALL,
Secretary.
Offices of the Company: Willoughby Lane,
Tottenham, Aug. 10, 1894.

ISLE OF THANET GAS COMPANY.

SALE BY TENDER OF 80 NEW SHARES OF £25 EACH,

Being part of Additional Capital authorized to be raised by Resolutions passed at a Special Meeting of Proprietors held on the 20th of July, 1894, in pursuance of the Powers of the Thanet Gas Act, 1877.

THE Directors of the Isle of Thanet Gas Company GIVE NOTICE that they will be prepared to receive, not later than Ten o'clock a.m., on Friday, the 31st of August, 1894, sealed TENDERS for 80 SHARES OF £25 EACH.

The Capital now offered is required for the Extension and Enlargement of the Company's Works.

The existing Paid-Up Capital of the Company is as follows:—

£36,000 Margate Consolidated Stock,
160 New £25 Shares (fully paid up),
£7000 Debenture Stock, 5 per cent. per Annum.

The Consolidated Stock and the New Shares to be issued are entitled to a Dividend of 7 per cent., to be increased or diminished 5s. per cent. for every Penny charged in diminution or excess of the Standard Price of Gas—viz., Four Shillings and Twopence per 1000 Cubic Feet.

The Dividend on the Consolidated Stocks for the last Twelve Months was at the rate of 10 per cent. per annum; and the Price of Gas, since Jan. 1, 1894, has been 2s. 10d. per 1000 feet.

Forms of Tender can be obtained at the Gas-Works, Margate, or will be sent by post on application.

By order,
THOMAS C. FULLER,
Secretary.

COLNEY HATCH GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, New Southgate, on Thursday, the 30th day of August next, at six o'clock in the evening precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 30th of June last, to declare Dividends, to consider Remuneration of Secretary, and for other Purposes.

By order,
W. H. HARDY, F.C.A.,
Secretary.

Aug. 9, 1894.

BROMLEY GAS CONSUMERS' COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the Bell Hotel, Bromley, Kent, on Wednesday, the 22nd day of August inst., at Six o'clock precisely, to receive the Report of the Directors and the Balance-Sheet confirmed by the Auditors, to Declare Dividends, to Elect an Auditor, and for General Business.

The Transfer Books will be closed from the 10th to the 22nd of August, 1894, both days inclusive.

By order of the Board,
HENRY W. AMOS,
Secretary.

Offices at the Works, Bromley, Kent,
Aug. 10, 1894.

Price 2s. per dozen, or 10s. 6d. per 100, post free.

CONSPIRACY and Protection of Property Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

*** *The Act extends to Scotland and Ireland.*

RIDDINGS DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY MEETING of the Shareholders of the above Company will be held at the Offices of the Company, No. 30, Gracechurch Street, in the City of London, on Friday, the 31st day of August, 1894, at Three o'clock in the afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ending the 30th day of June last, to Declare a Dividend, to authorize the borrowing on mortgage of the undertaking of the sum of £5000, and to transact the General Business of the Company.

The Transfer Books will be closed from the 18th to the 31st of August, both inclusive.

By order of the Board,
ALFRED LASS,
Secretary.

Offices: 30, Gracechurch Street,
London, Aug. 10, 1894.

MITCHAM AND WIMBLEDON DISTRICT GAS-LIGHT COMPANY.

INCORPORATED BY ACT OF PARLIAMENT, 1867.

NOTICE is Hereby Given, that the FIFTY-FIFTH ORDINARY HALF-YEARLY GENERAL MEETING of the Shareholders of this Company will be held in the Board-Room, at the Works, Mitcham, in the County of Surrey, on Tuesday, the 28th day of August, 1894, at Three o'clock in the afternoon precisely, to receive the Report of the Directors, and a Statement of the Accounts for the Half Year ended June 30 last, to declare a Dividend, and for General Business.

The Transfer Books will be closed from the 13th inst. until after the meeting.

By order,
BENJAMIN GREEN,
Secretary and Manager.

Offices and Works: Western Road, Mitcham,
Aug. 7, 1894.

HOLMSIDE GAS COALS.

(Wrought out of Holmside and South Moor Collieries.)

PRESENT production 4000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16¼ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of nearly

600,000 Tons per Annum.

Full particulars on application to

MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-ON-TYNE.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

COKE BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT.)

New Design, with two Cutting Rollers, making less Breeze than their old pattern.

For Exhauster Advertisement, see last week.

GEORGE WALLER & CO.,
PARK STREET, SOUTHWARK, E.C.,
And at STROUD, GLOUCESTERSHIRE.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Bombay Gas Company, Ipswich Gaslight Company, Devonport Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY,
LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON,
FITTER.

JOHN BROWN & CO., LTD., SHEFFIELD,

Proprietors of

ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
Telegrams: "ATLAS SHEFFIELD."

HEATHCOTE GAS COAL.

RICH IN ILLUMINATING POWER AND YIELD OF GAS.

ABOVE THE AVERAGE IN WEIGHT AND QUALITY OF COKE.

MAINTAINS A HIGH STANDARD IN RESIDUALS.

THE GRASSMOOR Co., Ld., CHESTERFIELD.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

LONDONDERRY GAS COALS
FROM THE
MARQUIS OF LONDONDERRY'S COLLIERIES,
COUNTY OF DURHAM.
Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO
S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

CAST-IRON PIPES
FOR GAS AND WATER.
Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.

VALVES
FOR GAS, WATER, AND STEAM.
TELEGRAMS: "PIPES GLASGOW."
WM. MACLEOD & CO.,
56, ROBERTSON STREET, GLASGOW.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
CANNEL & COAL.

TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield ofGas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI LONDON, W.C.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton	10,500 cubic feet.
Illuminating Power	16·4 candles.
Coke	68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to
THE WALLSEND & HEBBURN COAL COMPANY, LTD.
B Lombard Street, NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

HUNTER'S
OXIDE OF IRON.
JAMES HUNTER, LESSEE, MINER, AND SHIPPER OF
NATURAL IRISH BOG ORE.
This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.
Samples and Prices on application.
11, BAY STREET, PORT GLASGOW.
Telegrams: "HUNTER, PORT GLASGOW."
Established 1872.

LOW MOOR BLACK BED GAS COAL.

YIELD OF GAS PER TON	10,375 CUBIC FEET.
ILLUMINATING POWER	17·50 SPERM CANDLES.
COKE	75 PER CENT.

Prices, f.o.r. or f.o.b., on application to
GEORGE & JOHN HAIGH,
RAVENS LODGE AND CONYERS' COLLIERIES,
DEWSBURY.
A TRIAL IS RESPECTFULLY SOLICITED.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS TOOLS GENERALLY.
London Office:
90, CANNON STREET, E.C.

T. B. KITTEL, SHEFFIELD.
CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL
ENGLISH & SCOTCH CANNELS.
REAL SILKSTONE GAS COAL
ANALYSIS AND PRICES ON APPLICATION.
T. B. KITTEL, SHEFFIELD.

TROTTER, HAINES, & CORBETT
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.
Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

THE SILICA FIRE-BRICK COMPANY,
OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.
Trade Mark: "SILICA."
These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY
Strongly recommended where EXCESSIVE HEATS have to be maintained

THORNLEY GAS COALS
WORKED BY THE
WEARDALE IRON AND COAL COMPANY, Ld.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.
The Analysis made by Messrs. J. and H. T. Pattinson, Public Analysts for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a Working Analysis made of these Coals by the Tudhoe and Sunderland Bridge Gas Company:—

[COPY.]
TUDHOE AND SUNDERLAND BRIDGE GAS COMPANY.
Tudhoe Gas-Works,
Spennymoor,
8th June, 1893.

Messrs. The
WEARDALE IRON & COAL COMPANY, LTD.
GENTLEMEN,
For the last two months we have used your **THORNLEY GAS COAL** exclusively at these gas-works; and I have pleasure in herewith giving you the actual results obtained during the trial.
Yield of Gas per ton: 10,300 cubic feet.
Yield of Coke: 13½ cwt.
Illuminating Power of Gas, average of a series of tests, **17 Sperm Candles.**
The Coke was of excellent quality.
The following is a complete ultimate Analysis of the Coal.

	Per Cent.
Carbon	83·128
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
	100·00

I am, Gentlemen,
Yours truly,
A. B. COWAN,
Manager.

For Price, &c., apply to the
WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

FOR **TUBES AND FITTINGS** APPLY TO

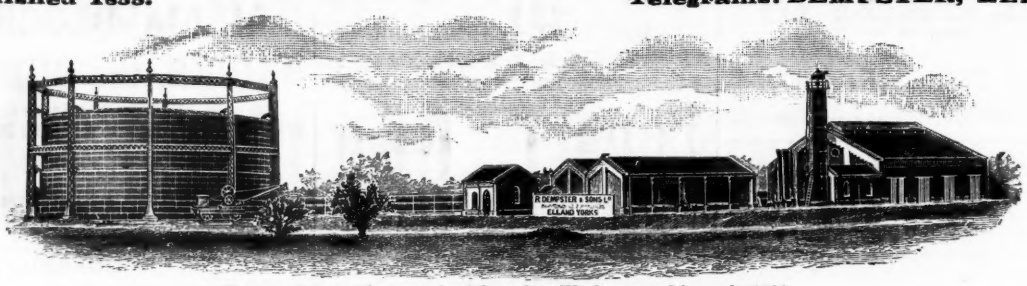
JOHN BROTHERTON, LTD., IMPERIAL TUBE WORKS, **WOLVERHAMPTON.**

R. DEMPSTER & SONS, L^D.

GAS ENGINEERS AND CONTRACTORS,

ELLAND, YORKS.

Established 1855. **Telegrams: DEMPSTER, ELLAND.**



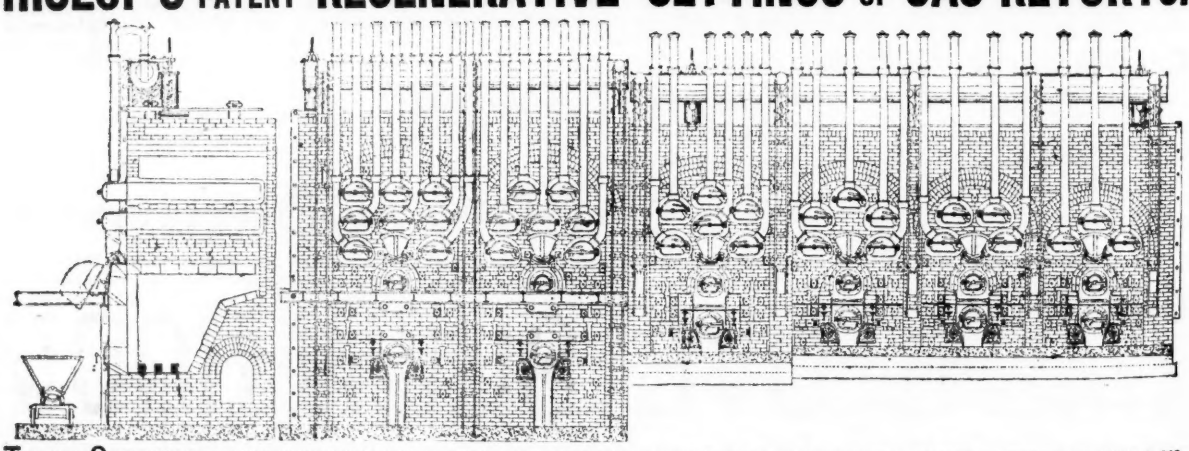
Engraved from Photograph of Complete Works erected by us in 1893.

The whole of the Apparatus, Foundations, Retort-Work, Buildings, and Levelling of Site have been executed by our men, without Sub-Contracts.

Estimates and Illustrations for complete Works, or for any detailed parts, supplied gratis on application.

Tenders given for all kinds of Structural Ironwork.

HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE POSITIVELY UNRIVALLED IN PRODUCTIVE CAPACITY, DURABILITY AND SIMPLICITY OF MANAGEMENT. RETORTS OF ORDINARY DIMENSIONS, CARBONIZING FROM 18 TO 24 CWT. OF ENGLISH AND 21 TO 26 CWT. OF SCOTCH COAL PER 24 HOURS, DEPENDING UPON THE NATURE OF THE COAL, AND PRODUCING UP TO FULLY 13,000 CUBIC FEET PER MOUTHPIECE IN THE SAME TIME, AND WITH THE SMALLEST EXPENDITURE OF FUEL ATTAINABLE, AND RETURNING IN PROFIT THE ENTIRE COST OF ERECTION WITHIN TWELVE TO EIGHTEEN MONTHS, AND THUS REDUCING TO INSIGNIFICANCE THE INCREASED COST OF THESE SETTINGS OVER THE COMMON OR GENERATOR FURNACE SYSTEMS.

THESE SETTINGS ARE EXTENSIVELY ADOPTED, AND ARE ERECTED UPON THE SHALLOW AND STAGE FLOOR PLANS. THEY ARE ADAPTED TO ANY EXISTING ARRANGEMENTS, AND PERFECT SATISFACTION GUARANTEED. THE COMPOSITION OF FIRE-RESISTING AND OTHER SPECIAL FIRE-CLAY MATERIALS FURNISHED IS OF THE HIGHEST ORDER; AND THE SYSTEM AS A WHOLE, AS NOW PERFECTED, IS THE RESULT OF LONG EXPERIENCE AND CAREFUL STUDY OF THE PRINCIPLES OF GASEOUS FIRING.

Drawings and Specifications are furnished for the complete erection of Ovens, with or without Retort and Bench Mountings; or complete erection undertaken if required, and carried out by specially Trained Workmen.

Further particulars may be obtained on application to the Patentee's Agents: C. M. HAMILTON, 5, Stuart Street, Shawlands, Glasgow; J. E. FISHER, Stourbridge; JOHN WALSH & SONS, Retort Builders, Halifax, Yorkshire; RICHARD TURNER, Retort Builder, Denton, Lancashire; and from the Principal Agent, R. F. HISLOP (son of Patentee), Gas-Works, Paisley, N.B.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine quâ non* TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED AND AFFORDING THE HIGHEST SATISFACTION.

SPENT LIMES NO LONGER WASTE PRODUCTS

Under G. R. HISLOP'S Patents, all Spent Limes are most effectually, economically, and continuously recovered at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it.

Descriptive Pamphlets and Terms from Agents as above.

THE DAVIS GAS-STOVE CO., LTD.

ENLARGEMENT OF PREMISES.

IMPORTANT ANNOUNCEMENT.

Having acquired, in the rear of our old Premises,

59, Queen Victoria Street, E.C. (two doors from Mansion House Station),

more than double the superficial area formerly at our disposal, we have now the most

AMPLE AND COMMODIOUS

GAS-STOVE SHOW-ROOM

in London, where those interested in **Cooking, Heating,** *and* **Hot-Water Circulating Gas Apparatus** *may rely upon seeing, with comfort and convenience, the various samples of our* **Manufacture.**

FACTORY & OFFICES : CAMBERWELL. Show-Rooms: 59, QUEEN VICTORIA STREET.

All communications to Camberwell.

GAS AND WATER PIPES.

Telegraphic Address: "RITCHIE MIDDLESBROUGH."

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS,

Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY,

CHESTERFIELD.

TRADE	TELEGRAMS:	LONDON AGENTS:
CXC	"JACKSON"	BECK & Co.,
MARK.	CLAY CROSS.	130, GT. SUFFOLK ST., S.E.

GODDARD, MASSEY, & WARNER'S

IMPROVED

Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICE APPLY TO

GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

BURT BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (Four Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations—

ILKESTON.	BURY.	CHORLEY.
WIDNES.	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'.	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
HUDDERSFIELD.	ORMSKIRK.	LUTON.
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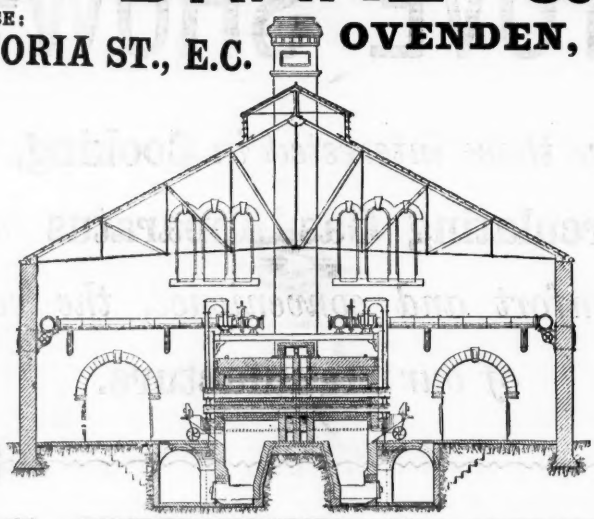

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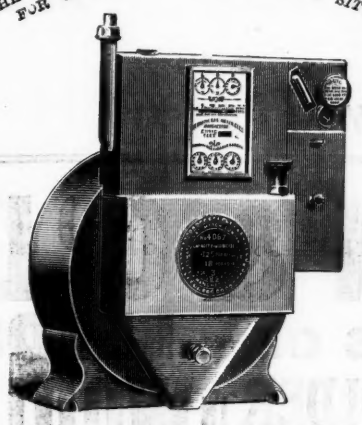

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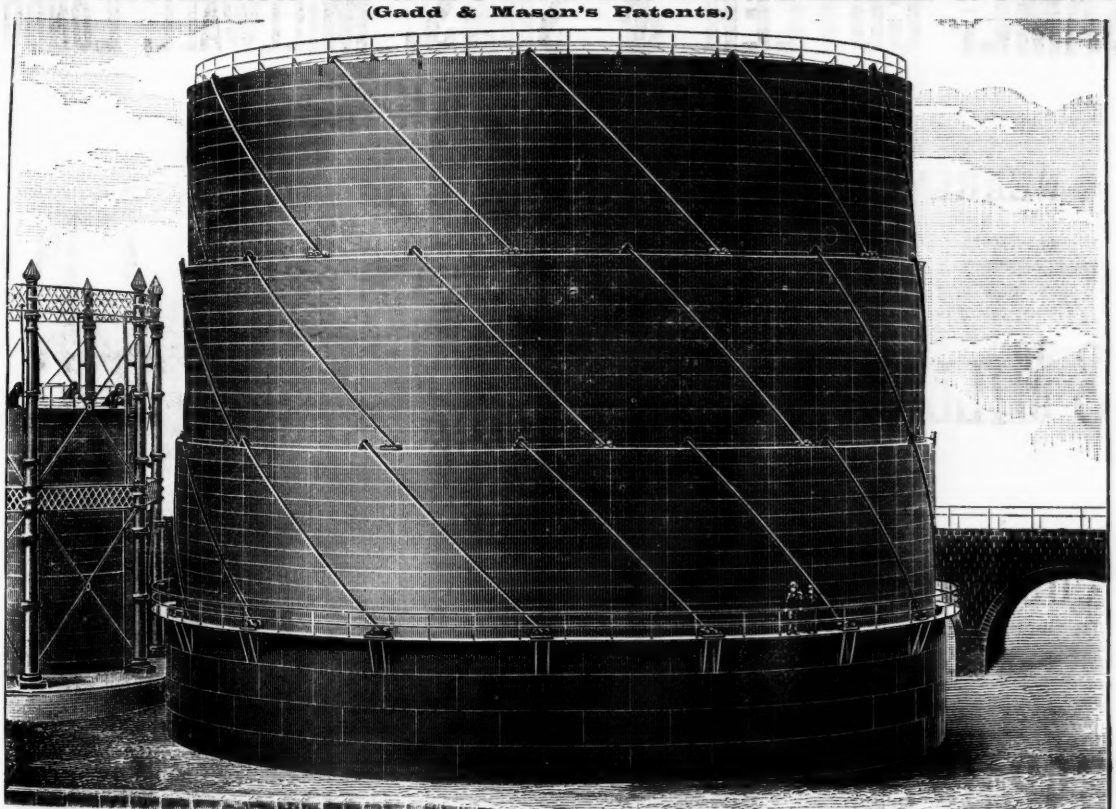

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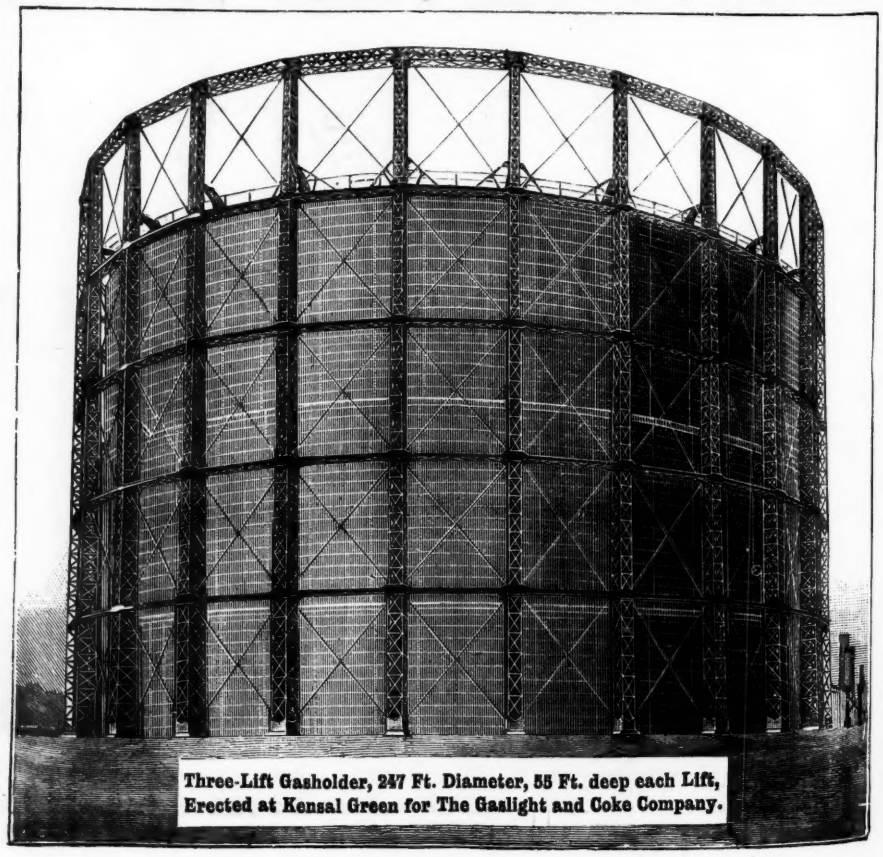

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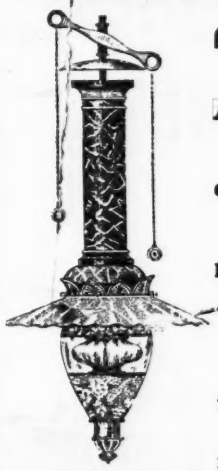
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